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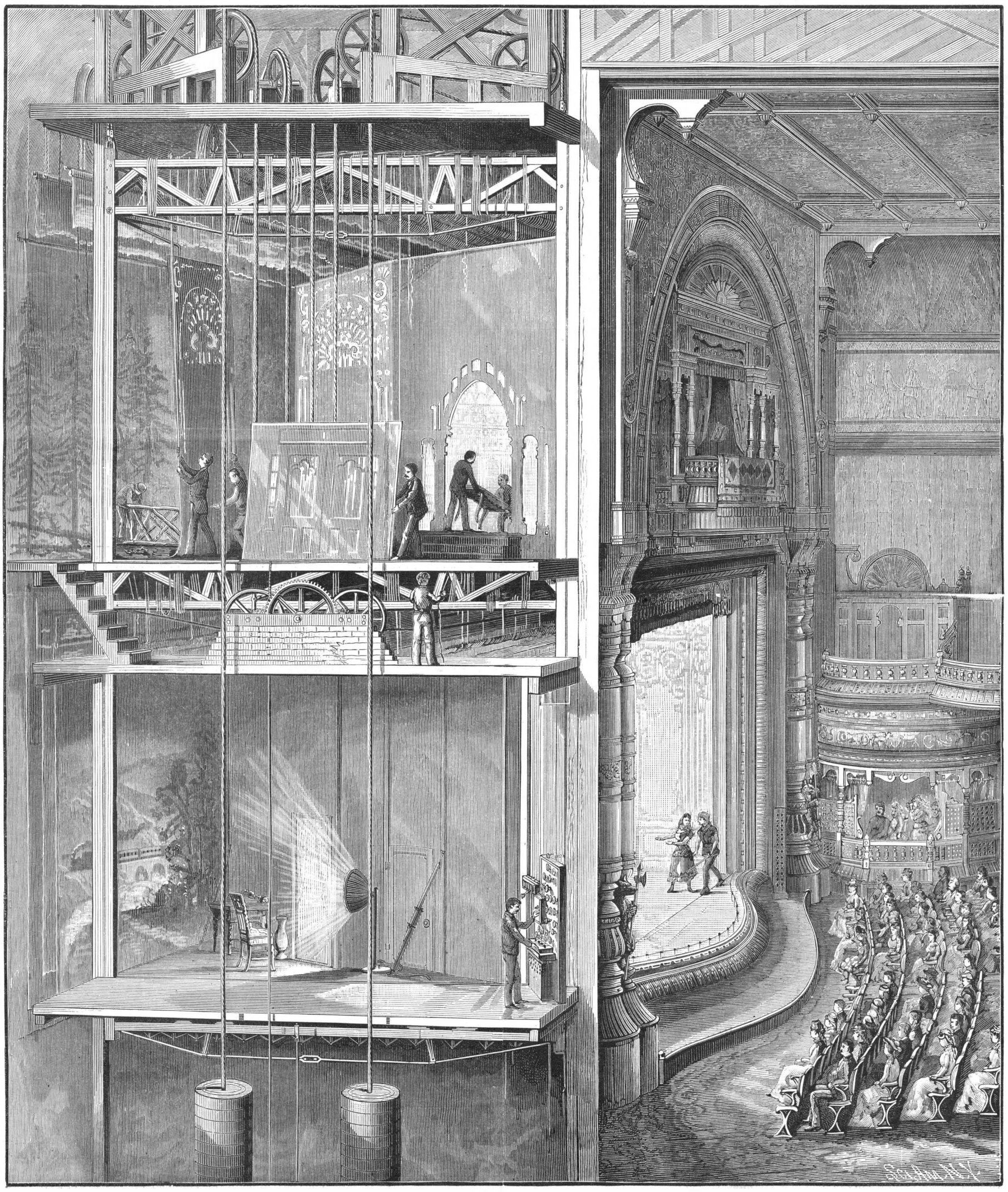
MOVABLE THEATER STAGES.

For a few years back, or since Richard Wagner first brought out the Niebelungen-lied at Bayreuth, the tendency in first class theaters and opera houses has been to greater elaboration of the scenic details, the more vivid representation of the surroundings connected with the plot of the play or opera. It was on this account that a temple was specially built in which to present the best illustration of the "music of the future." Thus also has Mr. Henry Irving obtained phenomenal success in England, and won great favor here, by the hard study and unstinted labor he gives to the perfecting of the scenery and stage equipments for the setting of his plays. Yet in all of the additional work now demanded of stage managers, there has been but little aid extended by inventors, and but few theater appliances patented. The illustration we herewith present, however, affords a view of an improvement practically tested at the Madison Square Theater in this city, which has not thus far



THE MOVABLE STAGE AT THE MADISON SQUARE THEATER, NEW YORK.

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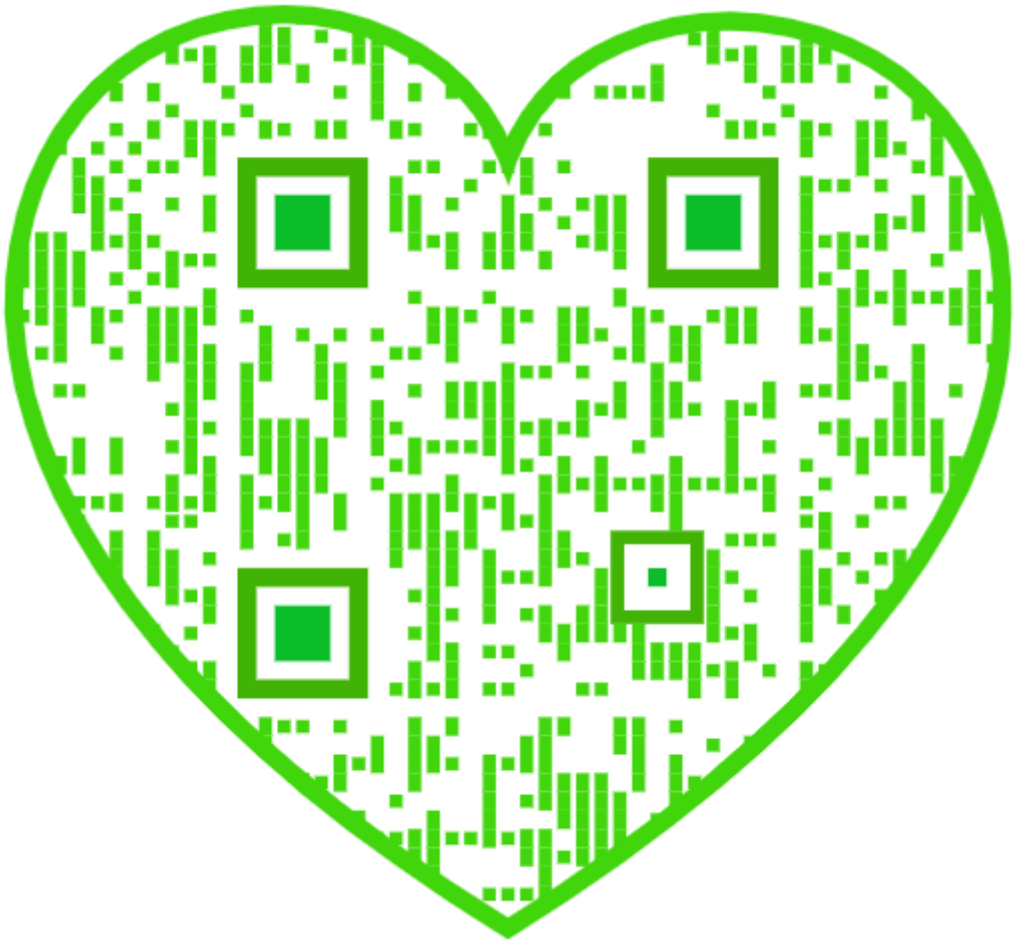

been put in operation in any other theater, and which would seem to afford every facility for the elaborate setting and changing of scenes without necessitating long "waits" on the part of the audience.

Our illustration affords a view of two theatrical stages, one above another, to be moved up and down as an elevator car is operated in a high building, and so that either one of them can easily and quickly be at any time brought to the proper level for acting thereon in front of the auditorium. The shaft through which this huge elevator moves up and down reaches 114 feet from the roof to the bottom of the cellar below, and the stages so moved are built up in a compact, two-floored structure of timber strapped with iron, knitted together by truss beams above and below, and substantially bound by tie and tension rods. The whole makes a structure fifty-five feet high, twenty-two feet wide, and thirty-one feet deep, weighing, as stated by the management, forty-eight tons, and having a vertical movement of 25 feet 2 inches at each change.

This immense contrivance is suspended at each corner by two steel cables, each of which would be capable of sustaining far more than the whole load, and these cables pass upward over sheaves or pulleys set at different angles, thence downward to a saddle, to which all are connected. Connected to this saddle is a hoisting cable, attached to a hoisting drum, by the rotation of which the stages are raised and lowered. Practically, only forty seconds are required to raise or lower a stage into position, and four men at the winch are as much as is ever required. This movement is thus easily effected, without sound, jar, or vibration, from the nice balancing of the stage and its weight with counterweights, which are suspended from the saddle to which the cables supporting the weight of the stages are attached.

In combination with each of these movable stages are borders and border lights arranged to throw light down upon the stage, and so connected with flexible gas tubes as to be readily turned on and off; each stage has its trap floor, with traps and guides and windlasses for raising the traps—the space for this, and for operating the windlass under the top stage, being about six feet. Our illustration shows that, while the play is proceeding before the audience, another scene is being arranged by the assistants on the upper stage, to be followed, when this is lowered, by similar preparations for the succeeding scene, should this be necessary, on the stage that will then be twenty-five feet below.

Independent of the peculiarity of the movable stages, there were many innovations on former practices in the fitting up of this, one of the pleasantest of New York's theaters, some four years ago. Fresh air is forced over steam radiators and through pipes to every part of the floor of the auditorium, or it is cooled and sent through the same pipes in the summer, but under such a system that it can conveniently at any time be shut off from any section; there is also a ventilating shaft in the roof through which the vitiated air is carried off, so that the whole atmosphere of the house is renewed, it is claimed, six times in every hour. [The whole matter of the ventilation of the Madison Square Theater was fully explained, with illustrations, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 250.] Another noticeable feature is that the orchestra, instead of occupying the usual position just below and in front of the stage, is placed in a balcony at the top, just over the stage opening, in the proscenium arch, thus keeping the view of the stage from the parquette unobstructed.

Not a little fun was made of Mr. Steele Mackaye, in 1879, when he obtained his patent for and proposed to build the first movable stage, as here represented. The details of Mr. Mackaye's patent were not as completely worked out, although the idea was there, as they subsequently were by Mr. Nelson Waldron, the stage machinist, who elaborated the system and obtained a subsequent patent therefor, under which these movable stages have since been so successfully and satisfactorily operated at the Madison Square Theater.

The architecture of this theater, by Messrs. Kimball and Wisedell, and the decoration, by Mr. Louis C. Tiffany and Mrs. Wheeler, have received wide and deservedly high praise; many features were novelties, but there was nothing inappropriate or commonplace.

The Phonograph in Africa.

It is said a Congo traveler will invite the natives to talk into one of these devices, the tin foil negatives to be sent to Berlin and studied by experts. Why would not this be a good way of obtaining explicit information as to the views of the natives upon the differences between De Brazza and Stanley? We believe the phonograph is now tolerably successful in reporting spoken words—that is, provided the hearer *already* knows what has been said into it, and what he may, consequently, expect to hear—so that on a subject of this character the confusion of tongues at the tower of Babel would probably be simplicity itself compared with what the machine might be made to report.

Clothing and Food for Arctic Explorers.

There will be, in all, three vessels and 140 men, of whom 20 are officers, shortly starting on the Greely relief expedition. Every precaution which former experience has pointed out is evidently being taken to provide for the safety and, so far as possible, the comfort of these Arctic voyagers. In the clothing, which is made to measure for each one, officers and men are to be fitted out alike except as to the badges of rank.

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NEW YORK, SATURDAY, APRIL 5, 1884.

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PROBABLE DEFEAT OF THE BAD PATENT BILLS.

The vigorous efforts made during the past few weeks by the friends of industry and invention to enlighten the minds of their representatives in Congress concerning the evils likely to follow the proposed patent legislation have been attended with good results.

In the SCIENTIFIC AMERICAN for March 15 we summarized the nature of the evils that would follow if the bills then under consideration were passed—naming the Anderson bill, for reducing the lifetime of patents to five years; the Voorhees bill, for giving to anybody who wished it the free right of any patent; and the Calkins bill, for diminishing the value of property in patents by obstructing the patentee in appealing to the courts. This article was quoted at some length by the Associated Press, and sent by telegraph to all parts of the country. It had an immediate effect in arousing individual action in many places, which took shape in the organization of public meetings, the passage of resolutions, the sending of hundreds of public and personal petitions to Congressmen, and the presentation to them of a large mass of valuable evidence, all tending to show how wrong and unwise the proposed enactments were likely to be. That the information thus furnished to Congress has had weight with some of the members is seen in the rejection by the Patent Committee of the Anderson five year bill, and the further postponement of the other bills. The chairman of the House Committee on Patents, on March 22, read the following:

"This bill (H. R. 3,617) proposes to amend section 4,884 of the Revised Statutes by striking out the word 'seventeen' and inserting the word 'five,' and thereby make a most radical and unjust change in the patent laws of this country, its effect being to limit the life of a patent to five years. Such a change is not consistent with the spirit of our Constitution and laws made for the benefit and encouragement of inventors, and would be an act of gross injustice to the great mass of inventors of this country, who have done so much to develop the growth, wealth, and prosperity of the country. As to the right of property which the inventor has in his inventions, a recent and learned writer on patent law says: 'The right of property which an inventor has in his invention is excelled in point of dignity by no other property right whatever.' Contrasted with him who acquires property by inheritance or devise, contrasted with him who acquires property by marriage or donation, contrasted with him who acquires property by revenue from the barter of merchandise or from the yield of money loaning, he who acquires property by invention, by bringing into being things which before were not, stands pre-eminently and confessedly on a higher foundation.

"The same learned writer again remarks: 'The inventor is not the pampered favorite or beneficiary of the Government or of the nation. The benefits which he confers are greater than those which he receives. He does not cringe at the feet of power, nor secure from authority an unbought privilege. He walks everywhere erect, and scatters abroad the knowledge which he created. He confers upon mankind a new means of lessening toil, or of increasing comfort, and what he gives cannot be destroyed by use or be lost by misfortune. It is henceforth an indestructible heritage to posterity. On the other hand, he receives from the Government nothing which costs the Government or the people a dollar or a sacrifice. He receives nothing but a contract which provides that for a limited time he may exclusively enjoy his own.'

"The committee are unanimously of the opinion that the present limit of seventeen years is a reasonable limit, and therefore recommend that the accompanying bill do not pass."

Nothing could be more satisfactory than the promulgation in Congress of sentiments like these, which, it is safe to say, are earnestly shared by the mass of the people of the United States.

This excellent report was followed on the 24th of March by a resolution of inquiry, which we hope will be promptly passed. It was read by the Hon. Mr. Vance, and referred to the Patent Committee of the House:

"*Whereas*, Information has been obtained, from sources entirely trustworthy, which indicates that the full, thorough, expeditious, and accurate administration of the laws and regulations which pertain to our great American patent system is being obstructed and impeded on account of a deficiency in the room and an insufficiency of force at the disposal of the Department of the Interior; therefore,

"*Resolved, etc.*, That the Secretary of the Interior be, and he is hereby, requested to report to this House such information as he may have touching the deficiency of room and the insufficiency of force in the Patent Office, and to what extent, in his opinion, the rights of inventors and the public interests are affected by the present want of room and additional force in that department; and that he be requested to make such suggestions as he may deem proper as to what legislation is necessary to remedy the grievances indicated."

In respect to the other bills, their immediate consideration has been postponed, and their passage looks somewhat doubtful. It is, however, desirable that all who have views to express or information to furnish should send the same to Senators and Representatives—who in this way become informed as to the true needs of their constituents, and are enabled to govern their legislation accordingly.

The convention of the National Association of Inventors assembled at Cincinnati, Ohio, on the 25th of March, and was

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quite largely attended. Mr. James S. Zerbe, of Ohio, was chosen permanent president, Charles M. Travis, of Indiana, and G. Burleigh, of Mass., secretaries. Some very stirring speeches were made, and resolutions passed, touching the rights of inventors and the duty of Congress to aid and encourage them. We give in another column a brief report of the organization and resolutions.

One of the contributions sent to the convention was an able and important letter from the Hon. Benjamin Butterworth, the present Commissioner of Patents. He shows how greatly the country is indebted to our men of genius, who as inventors and patentees are the leading spirits in the development of industry and progress. We give extracts from the Commissioner's letter elsewhere. We also give quotations from the proceedings of various other meetings, from letters and contributions sent to us, which speak for themselves and require no comment. We greatly regret our inability to give all these in full.

EXTRACTS FROM THE LETTER OF THE HON. BENJAMIN BUTTERWORTH, COMMISSIONER OF PATENTS, TO THE CINCINNATI CONVENTION OF INVENTORS.

UNITED STATES PATENT OFFICE,
WASHINGTON, March 23, 1884.

I feel a deep interest in the proceedings of the meeting. I realize the possibilities for good which wait upon its action. Careful investigation has made me more fully to realize how greatly this country is indebted to the inventors, and their practical coworkers the manufacturers, for its unexampled prosperity. A study of the facts warrants me in saying that no equal number of men have contributed more, if so much, as the inventors in building up our great industries, and yet no equal number of men have exerted less influence in the political field, where the needs of various interests are discussed, and the legislation in that behalf suggested and moulded.

. . . I want to notice for a moment the objection urged against the patent system by some of those who are most interested in sustaining it. I refer to the agriculturists.

I submit that no man need use an article of modern improvement, unless he finds it to his interest to do so. We may still plow with a wooden mouldboard. We may still drop corn with the fingers, and cover it with the hoe. We may still sow wheat 'broadcast,' and eschew the drill. And we may cut grain, wheat, and oats with the sickle, or, if our opposition to improvements is not radical, we may use the cradle. We may leave the reaper and mower, the raker and binder, severely alone if we choose. We may then resolutely thrash the grain with the flail or tramp it out with horses. We are under no obligation whatever to use a thrasher, and not the slightest to use a cleaner and separator.

We may still haul our crops to market in jolt-wagons. There rests upon us no legal obligation to utilize the railroad. None of us are compelled to use the telegraph. We may in case of sickness send fifty miles by messenger on a horse for a doctor, and bring him back in the same manner; and if the patient dies before he arrives, the relatives and friends need not be summoned by telegraph, nor come by railroad; they can be advised by the postman, and come in the old way, if at all. And in the mean time the corpse can be kept on ice, provided the ice is not manufactured by one of those patent ice machines. It is the right of the citizen to drown, if he prefers it, to being saved through the instrumentality of one of those patent life saving contrivances which are in common use along the coast. It is my lawful right, if I own a coal mine, to draw the coal up with the old fashioned windlass, instead of using steam power and modern appliances. I have an equal right to toil up seven stories in a hotel, instead of riding up on one of those patent elevators. I can pay a dollar a rod to fence my farm with posts and boards, instead of using barbed wire at half the cost.

What I want to show is, that the blood-bought privileges of sticking to the old way remain to us in spite of the patent law.

Had we better do this? Better stick to the old way, or encourage the genius of invention, and improve our methods, lighten our labors, increase our comforts, embellish our homes, and add thus to the sum of our happiness?

But those patents levy on the people. Yes, they levy a dime, and in return give a dollar, and often ten. I can mention half a dozen inventions which alone have saved more to the people of the United States than our whole population have paid in the shape of tax and royalty to inventors since the foundation of our government, and more than they will pay in the next century. I may name the cotton gin, the spinning jenny, the power loom, the locomotive, the telegraph, the reaper and mower. Then let me add the power printing press. All except one, with their aids and auxiliaries, produced and perfected in less than a generation —less than fifty years. By the old method there are not adult laborers enough *in all the Southern States* to prepare the present cotton crop for the loom. By the old methods it would take *all the adult laborers of the North* to plant, tend, and gather the crops. *Not a shop or factory* could be spared a man or woman.

These assertions are not guesses nor wild assumptions, but the result of careful investigation.

I am astonished at the continual complaint made, that the agriculturist is oppressively taxed and burdened by our patent system; and this in the face of the fact that but for the hives of industry, the busy marts of our great cities, which have their origin and growth in the production of the machines, implements, tools, and appliances which are the fruits of the inventor's study, research, experiment, and labors, the business of farming would not be worth following—there would be no market.

The Cincinnati Convention.

The convention of the National Association of American Inventors was called to order by Mr. J. S. Zerbe on Tuesday afternoon, March 25, at 3 o'clock, in Music Hall, about 250 delegates being present, duly accredited. He explained the object of the association to be a united organization to work for the interests of inventors as regards legislation in Congress and for their mutual benefit. Hon. C. P. Lesher, of Lansing, Mich., was appointed temporary president of the meeting, and in his remarks, thanking those present for the honor conferred, he referred to the demagogism now exercised by certain members of Congress in regard to the subject of invention. Mr. G. Burleigh, of Massachusetts, was appointed temporary secretary. He tersely remarked that the object of the union of inventors was a noble one, and he trusted it would meet with grand success.

The roll of States was called, and the following were found represented: New York, Massachusetts, Wisconsin, Nebraska, Missouri, Iowa, Illinois, Indiana, Ohio, Pennsylvania, Kentucky, Tennessee, Georgia, and Mississippi.

The evening session was opened by President Lesher, in Dexter Hall, who announced that the first order of business was to read the report of the Committee on Permanent Organization. It was announced as follows:

For President, James S. Zerbe, Ohio; Secretaries, Charles M. Travis, Indiana; G. Burleigh, Massachusetts; John G. Geghan, Ohio, Sergeant-at arms. Vice-Presidents, John W. Lane, Maine; John F. Wood, Massachusetts; Fred. Grinall, Rhode Island; Frank Pratt, Connecticut; Leonard Hinkle, New York; Wm. Goddard, New Jersey; A. J. Nellis, Pennsylvania; John Fehrenbatch, Ohio; Chas. P. Lesher, Michigan; C. P. Jacobs, Indiana; J. T. Donguir, Illinois; J. E. Baker, Wisconsin; John. E. Buckston, Minnesota; John Zerr, Iowa; C. F. Hyde, Kansas; Dr. N. N. Horton, Missouri; W. F. Evans, Arkansas; L. L. Heeber, Kentucky; J. C. Ogletree, Tennessee; C. D. Campbell, Mississippi; George R. Platt, Louisiana; O. J. Parker, Florida; E. V. Caldwell, Alabama; K. D. Davis, Georgia; Miss Georgie Fay, Virginia; Irvin M. Scott, California; O. H. Cornelius, Oregon; Walcott Boardwell, Nevada; General F. M. Cass, Colorado; W. E. Wood, Texas; L. Deane, District of Columbia.

President Zerbe was escorted to the chair, and in taking his seat, expressing his thanks, took the opportunity of making a long speech, which touched upon the history of patents in England and in the United States, and explained at length the objectionable laws which were being legislated upon by the present Congress, two having been passed by the House, and one by the Senate.

The following resolutions were unanimously adopted:

"*Whereas*, The incentive and rewards given inventors by the Constitution of the United States and the laws of Congress passed thereunder have done more perhaps than any one cause to advance our whole country to the front rank in wealth, resources, and industries, among all nations of the world; and

"*Whereas*, Any material change in those laws would, in the opinion of this association, seriously retard our material progress as a people. Therefore,

"*Resolved*, That our Senators and Representatives in the United States Congress are respectfully requested to oppose the passage of any bill which would have the effect to discourage inventions by impairing the value of patented property or imposing any conditions on the owners of such property in prosecuting and maintaining their rights to the full value of their said property, which are not equally applicable under the laws of Congress to the rights of all property and the remedies provided to protect the same for all citizens of our entire country.

"*Resolved*, That the inventors, patent owners, brain workers, hand workers, and citizens of the United States, in convention assembled, where patent interest antagonize no other, but benefit all classes of the community alike, demand the continued protection of our present patent system unimpaired by Congress.

"*Resolved*, That, since the money derived from the fees paid by the inventors to the Government is ample to pay all the cost and charges, it is the imperative duty of Congress to provide sufficient force in the Patent Office to do the work well, and to keep it up to date, and in all details and particulars to thoroughly equip the Patent Office for its work, by providing sufficient accommodations for its force, an ample library of books and publications pertaining to patent and scientific matters, and full and complete digests of inventions in all the classes, and rooms and means to enable the inventor and patentee to search into the novelty of any device, or the state of the art in any given direction.

"*Resolved*, That the dignity and importance of the business of the Patent Office demand that it should be severed from the Interior Department and made a department by itself, with a head duly recognized as a member of the Cabinet.

"*Resolved*, That since the matters adjudicated in the Patent Office are in a very large degree legal in their scope and bearing, it is the evident necessity of the case that there should be a distinctly legal bureau or division of this office, clothed with the authority to hear and decide said matters and enforce its decisions.

"*Resolved*, That though there have been nearly 300,000 patents granted, there have been scarce a score of patents which the public has objected to, and no patent based on a wrong, which the courts have not finally held invalid."

We shall continue the report in our next.

Resolutions of the Erie, Pa., Board of Trade.

A meeting of manufacturers and inventors to take action upon bills pending in Congress which, if enacted, will affect the existing patent laws, was held on Friday evening, March 21, at the Board of Trade rooms. President Adams, after briefly stating the object of the meeting, called upon J. W. Wetmore, Esq., chairman of the committee appointed Thursday night to draught resolutions expressing the sentiment of Erie people concerned in changes of patent laws. Mr. Wetmore read the following:

Resolved, That we look with alarm at such legislation as is proposed in Congress by House bills Nos. 3,925, 3,934, 3,617, and Senate bill 1,558, relating to patents for inventions, and we, therefore, petition the Senate and House of Representatives not to enact those bills into laws. We believe them to be the embodiment of temporary prejudices, not the result of fair consideration of the constitutional provision on the subject and the true interests of the country. We do not ask for any favoritism in the legislation by Congress. The titles of the entire landed property of the United States and Territories are founded on discovery. Laws have been and are constantly being enacted to make such titles perpetual. The discoveries of inventors received no such favors even from the wise statesmen who adopted the beneficent policy in the Constitution. The title of the author of any book had three times the length of the term of the letters patent. With this early discrimination against inventors they still were stimulated to exertion, not with profit to themselves in the vast majority of cases, but with unbounded advantage to progress in manufacturing, transportation, and agriculture, and all the other elements of our wonderful material prosperity. Their rights as secured are not monopolies in the offensive sense of the term. They have less monopoly than the owners of other kinds of property have secured to them by law.

The inventors have richly returned compensation for the limited protection received, and the disposition to lessen that protection or take it away is an agrarian device held out to flatter people with false hopes of improving their rights and property by destroying those of others. New and unusual laws, specially tending to impair the rights and titles of inventors and manufacturers holding patents and to paralyze the motives to improvement by annulling the patent laws, are but the beginning of a crusade against all rights of property.

We therefore petition the Houses of Congress, that after defeating these attacks on the policy of the Constitution, they increase the scope and efficiency of the patent laws, while placing proper guards against their abuse.

Resolved, That copies of these resolutions be sent to the Pennsylvania members of the House and Senate in Congress.

Professor Thomson, when the president called for remarks on the resolutions Mr. Wetmore submitted, urged the necessity of making a decided protest at Washington. "If the bills become laws," said he, "I as well as others will be injured; I would not give a whistle for all the patents that can be obtained or all now owned. The proposed patent law changes authorize the stealing of the results of brain work. They are as bad as if a law were to be made prohibiting a man who worked ten years to pay for a farm from owning it longer than five years. The effect will be to destroy talent. We should employ every means to defeat these abominable bills."

The Electric Light and Gas.

When the electric light was introduced the city of Boston was paying $2 per 1 000 feet for gas, and private consumers were paying $2.80. Now the city pays $1.30, and private consumers $1.80. Boston has been a liberal patron of the electric light. Its streets have probably been lighted more brilliantly, for the past two or three years, than those of any other large city. And the police department of Boston has borne testimony to the value of this extra lighting as tending to prevent crime. But the gas has not been entirely crowded out of the streets, and it is now proposed to light the city again with gas, on the ground of its being more economical. It is suggested that large gas lamps, using about 100 feet per hour, be substituted for the former small ones. But the electric light folks show that such a lamp would cost the city $496 a year, against $237 now charged for an electric light of greater power. It is stated, however, that the gas folks only measure the large lamp at 26 feet per hour, in order to make it cheaper than the electric light, so that, with such cutting of rates on both sides, Boston is likely to be well and cheaply lighted. But neither the electric light nor any other cause seems to have any effect on the managers of New York gas companies. The latter are at liberty to use naphtha in making water gas at a cost of about fifty cents a thousand feet, while the Boston gas men have been compelled to make their gas of coal at a higher cost, but still the New York monopolists charge $2.25 a thousand feet.

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An Aid to Curing Alcoholism.

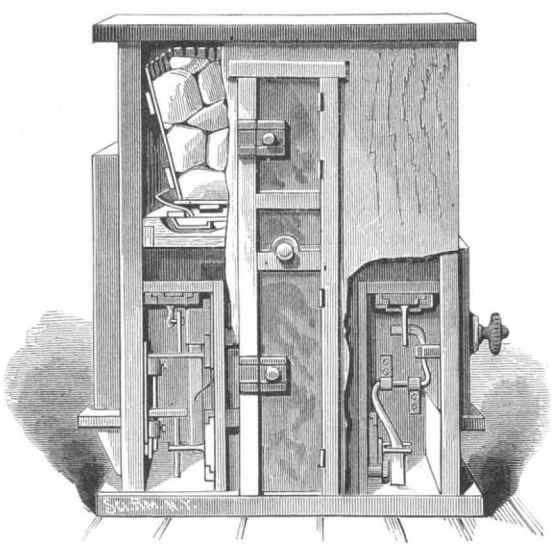
We believe the best authorities are generally skeptical as to there being any sure cure for confirmed habits of inebriety unless the effort in that direction be aided by a strong exercise of the will of the unfortunate subject of the bad habit. There are, however, many remedies recommended as aids in diverting or in a minor degree satisfying the appetite for strong liquors, which are undoubtedly of great advantage in some cases, and one of these is thus recommended by a self-styled "rescued man": "I was one of those unfortunates given to strong drink. When I left it off I felt a horrid want of something I must have or go distracted. I could neither eat, work, nor sleep. Explaining my affliction to a man of much education and experience, he advised me to make a decoction of ground quassia, a half ounce steeped in a pint of vinegar, and to put about a small teaspoonful of it in a little water, and to drink it down every time the liquor thirst came on me violent. I found it satisfied the cravings, and it suffused a feeling of stimulus and strength. I continued this cure, and persevered till the thirst was conquered. For two years I have not tasted liquor, and I have no desire for it. Lately, to try my strength, I have handled and smelt whisky, but I have no temptation to take it. I give this for the consideration of the unfortunate, several of whom I know have recovered by means which I no longer require."

IMPROVED REFRIGERATOR.

In the refrigerator illustrated in the annexed engraving, the air passages leading from the main chamber to the side air chambers are opened and closed from the outside, thereby excluding the warm outer air from the main and also from the ice chamber when the doors of either of the side air chambers are opened. It is formed with a central and two side air chambers, each of which has a door or window communicating with the outside.

The chambers at the sides of the central chambers are each formed with a side and top wall provided with openings that are closed by slides, in order to prevent the outer air from reaching the chamber and the ice chambers when the doors are opened. These slides may be operated in the same manner as those described, or they may be connected to a door or window by rock shafts so that opening the latter will close them at its first movement, while closing the latter will open them at its last movement.

Above these is the ice chamber, in the bottom of which are air passages that may be closed to cut off all communication between the ice and provision chambers before opening the door of the main chamber, the object being to shield the ice from the current of warm air which would otherwise rush in to fill the vacancy caused by the cold air rushing out. These air passages are opened and closed by slides connected together by pivoted arms operated by a rod projecting through the refrigerator wall; the rod is graduated in order that the amount of cold air can be regulated. In this refrigerator, the cold air not escaping while it is open, it requires but little ice and keeps the temperature even.

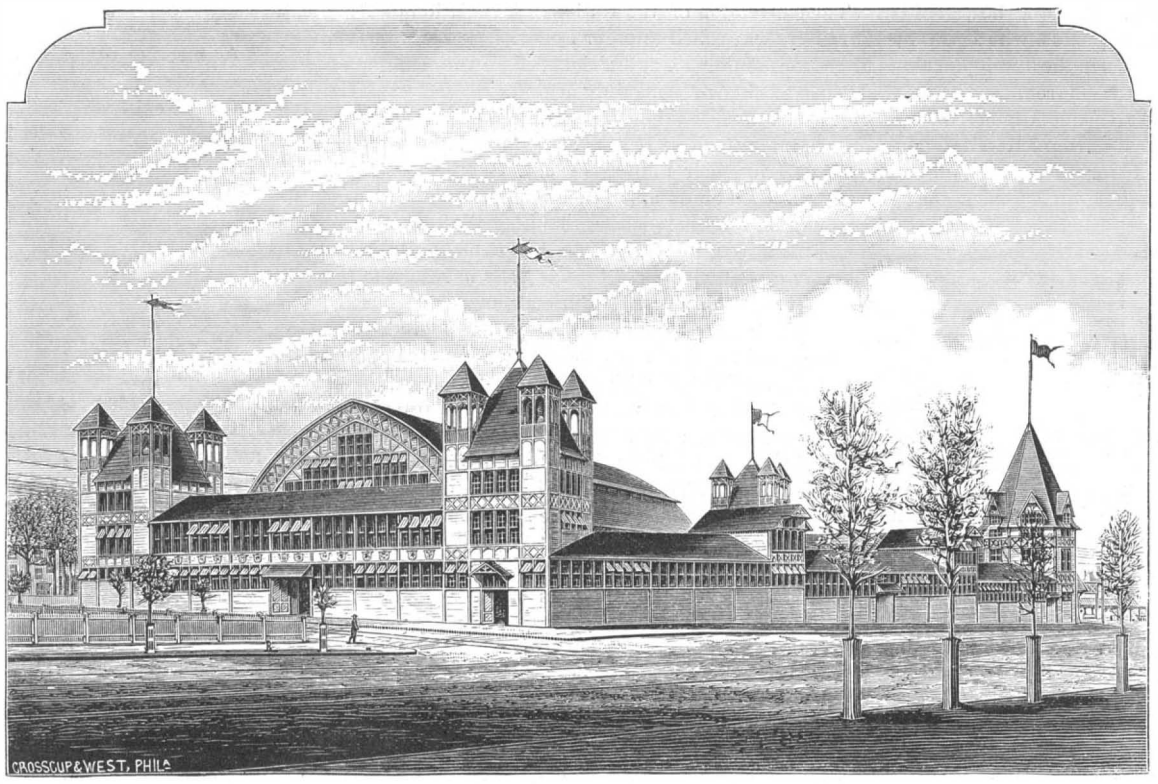


BERENS' IMPROVED REFRIGERATOR.

The engraving shows two other chambers in which provisions may be put temporarily. The wall separating these chambers from the main chamber can be readily removed for cleaning. This invention has been patented by Mr. Charles J. Berens, of Washington, Indiana.

THE INTERNATIONAL ELECTRICAL EXHIBITION.

As has already been announced in the columns of our paper, an International Exhibition will be held at Philadelphia next autumn, under the auspices of the Franklin Institute, of the State of Pennsylvania, for the Promotion of the Mechanic Arts. The exhibition will be formally opened on Tuesday, Sept. 2, 1884, and will remain open until Saturday, Oct. 11, 1884.



BUILDING FOR THE INTERNATIONAL ELECTRICAL EXHIBITION AT PHILADELPHIA.

The accompanying plate is a view of the exhibition building, which is now in process of erection, and which, by the terms of the contract, will be finished by the 15th of June. The building is being erected by Mr. Jacob R. Garber, from the plans of the architects, Messrs. Wilson Brothers & Co.

The following brief description will give a general idea of its character:

The main building will be rectangular, having a length on Foster Street of 283 feet and a breadth of 160 feet, extending from Foster Street to Lancaster Avenue on Thirty-second Street, and part of the distance from Foster Street to Lancaster Avenue on Thirty-third Street. A tower sixty feet high will be situated at each of the four corners of this building. One central arch of 100 feet span and 200 feet in length, of the Gothic style of architecture, will cover the greater portion of the space occupied by this building, while two smaller ones, having a span of thirty feet and running parallel to it on either side, will join the towers. The building will have second story apartments at its ends on Thirty-second and Thirty-third Streets respectively, with stairways leading up in the towers from the ground floor. The towers themselves will be three stories high. Two long and narrow hallways will afford communication between these apartments. The remainder of the ground will be inclosed by a large triangular building, one story in height and joined in the main wall. The main entrance will be at the corner of Thirty-second Street and Lancaster Avenue, another at Thirty-third and the Avenue, and one at each of the other towers. Five exits are provided for on the plans, but desirable changes may hereafter be made in the number and situation of both entrances and exits before the work is completed.

The meeting of the American Association for the Advancement of Science, which will be held this year in Philadelphia, and the expected presence of many representatives of the British Association, which will meet this year in Montreal, will attract a numerous and influential scientific gathering in Philadelphia during the time of the holding of the exhibition; and in order that so exceptional an opportunity to promote the interests of science shall not be lost, Congress has been requested to authorize the holding of a National Conference of electricians, to convene in Philadelphia at this time. Should Congress, in its wisdom, make the proper provisions for holding such a conference, the results promise to be of much value.

A comprehensive scheme of classification has been carefully elaborated; a system of rules and regulations to govern the internal management of the exhibition has been adopted; provisions have been made in the interest of intending foreign exhibitors, to relieve them of all trouble in respect to the passage of their exhibits through the Custom House, and the proper reception and care-taking of the same on their arrival; and arrangements have been made with a number of the leading transportation companies to return, free of charge, goods on which freight charges have been paid one way.

The above information, expressed in detail, has been published in the form of a twelve-page pamphlet, which, with a blank form of application for space, has been issued in the English, French, and German languages, and extensively circulated in the United States and throughout Europe.

There are evidences at this time, even, that the exhibition will be one of unusual interest and value. The active participation of several of the scientific bureaus of the United States Government and of all the leading electrical companies is assured. Numerous inquiries both from official and private sources have been received from abroad, and interesting and valuable contributions from European countries are confidently anticipated.

The circular of information herein referred to, with blank forms of application for space, may be obtained in the English, French, or German language by addressing a request therefor to the Secretary of the Franklin Institute, Philadelphia, Pa.

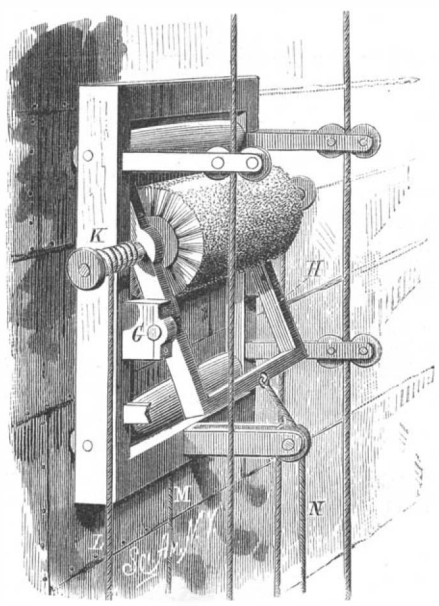
We are indebted to the courtesy of the *Journal* of the Franklin Institute for the cut which accompanies this article.

A Plan for Controlling the Spring Floods.

A Canada correspondent suggests that, instead of one great reservoir, that would be dangerous as well as expensive, it would be better to build a system of detaining works on all the small streams. The idea is to begin at all points where a four inch pipe will discharge the average water, and there make a two-foot bank to hold back the surplus, building "hundreds of thousands" of these small dams, at a cost of from five to ten dollars each.

IMPROVED SHIP CLEANER.

In the frame, which is made strong and light, are journaled two parallel curved rollers, which keep the frame about an inch from the bottom or side or the ship. From near the corners of the frame project four arms, and in the end of each are placed two wheels, between which the tightly drawn guide ropes pass. The frame is easily raised and lowered on these ropes, and brought against the surface to be cleaned. A frame, H, is pivoted in the blocks, G, projecting from the sides of the main frame. In the upper part of this frame is journaled a brush made with bristles of steel wire about six inches long. The shaft, K, of the brush projects beyond the sides of the frame, and is worked by means of two ropes, L, coiled reversely upon the projecting parts. When the brush is revolved in one direction by pulling on one rope, the other rope will be wound on the shaft and so on alternately, the shaft being revolved in opposite directions. The lifting rope, N, is secured to the end of the frame, H, passes over a pulley in an arm on the lower bar of the main frame, and then extends to the deck or to a boat at the side of the vessel. By pulling on this rope the lower end of the frame, H, will be lifted from the side or bottom of the ship, and the brush will be pressed against it. The degree of pressure can be regulated at will, and barnacles, rust, paint, etc., can be removed from a ship in a short time. The machine is rigged for work by extending a rope between suitable supports, and from a pulley on this rope are hung the guide ropes, which extend under the ship and over the gunwale on the other side.



COOPER'S IMPROVED SHIP CLEANER.

This invention has been patented by Mr. J. L. Cooper, and further particulars may be had by addressing Mr. James O. Cooper, No. 165 Fourth Street, Portland, Oregon.

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An Etching Ink for Glass.

For writing on glass with an ordinary steel pen, Dr. M. Muller prepares an ink containing fluorine. Equal parts of hydrofluoric acid, fluoride of ammonia, and dry precipitated barium sulphate are rubbed together in a porcelain mortar. When intimately mixed the mass is transferred to a dish made of platinum, lead, or gutta percha, and fuming hydrofluoric acid poured over it successively and rapidly stirred with a gutta percha rod, shaped like a pestle, until the impression left by the rod quickly vanishes. Glass written on with this ink is etched immediately, and the etched portions are so beautifully roughened that they are visible at a long distance. The ink only needs to act for fifteen minutes on the glass, and a longer action may be harmful, as the edges lose their sharpness.

In making good etching ink, the quality of the barium sulphate is of great consequence. It must be prepared by precipitating the solution of a barium salt (the chloride) with an excess of sulphuric acid, washing well by decantation, filtering, and drying at 248° Fahr. (120° C.). It is only in this manner that it can be obtained sufficiently fine and impalpable.

This ink cannot, of course, be kept in glass bottles, but only in gutta percha vessels closed with corks protected with wax or paraffine. Owing to its greater specific gravity, the barium compound used to thicken it naturally settles, hence it must be well shaken each time before using. It can be preserved in glass bottles that are protected within with a layer of wax or paraffine, which can be easily applied by warming the bottle over an alcohol or other smokeless flame, dropping in a piece of wax, and continually turning the bottle to bring the melted wax in contact with all sides. Even fuming hydrofluoric acid can be kept in such a bottle.

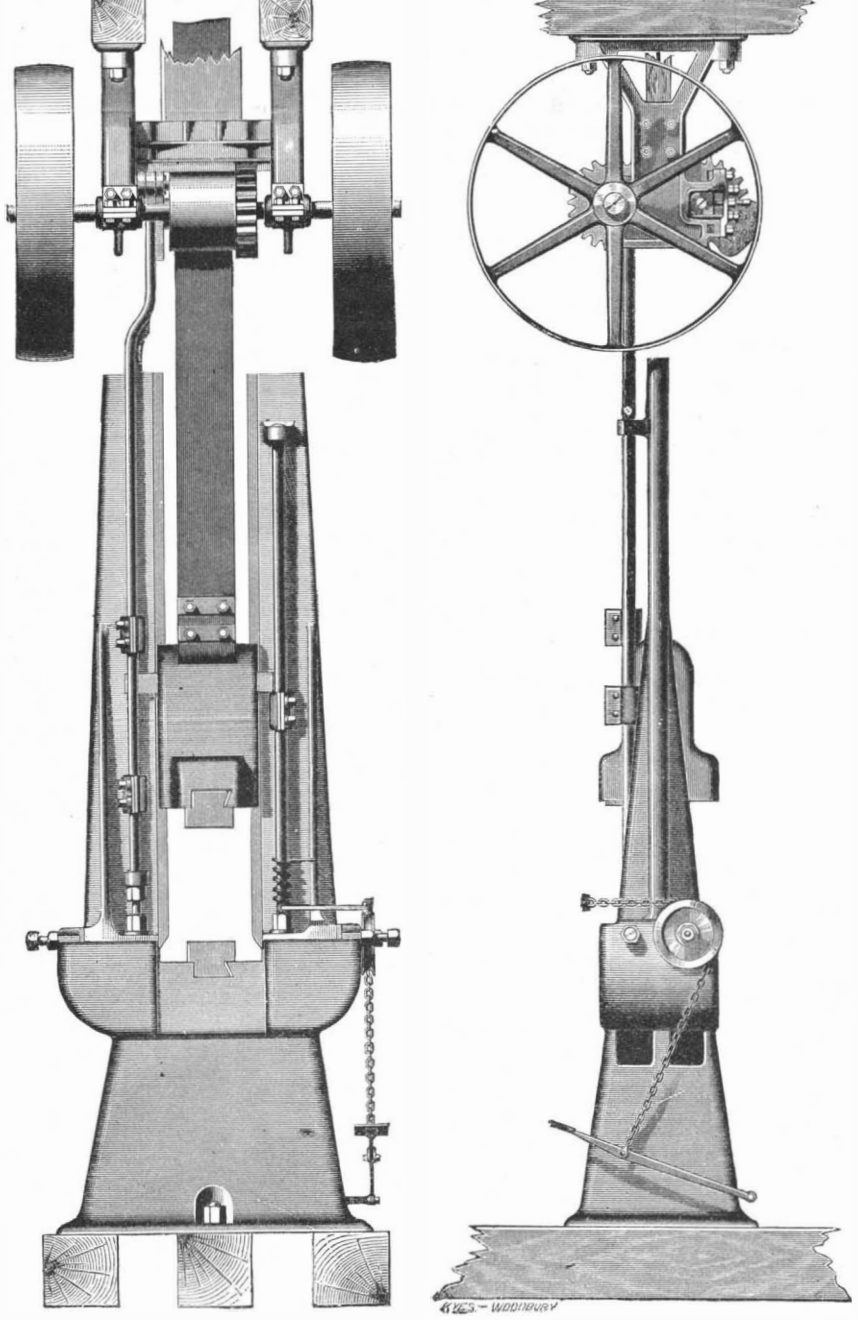
Concentrated hydrofluoric acid may cause serious inflammation and even ulcers, if left in contact with the skin for some time, so that care should be taken both in making and using the ink not to touch it to the fingers.

To make the etchings more distinct, and visible at a greater distance, it is frequently necessary with delicate lines, especially on graduated chemical ware, burettes, eudiometers, etc., to rub some red lead, soot, or clay over them. A small quantity adheres to the roughened surface, but it soon rubs off. The etchings made with this ink are so much rougher that if a strip of metal is rubbed over the lines some will adhere, and they acquire the color and luster of the metal. If a name is written on glass with this ink, and then the spot is rubbed with a thick brass wire, the name will appear in golden letters, and may be protected by a thin, colorless varnish. Lead may also be used, but for chemical apparatus, Dr. Muller employs platinum.
—*Neue Erfind. und Erfahrungen.*

THE REMINGTON DROP HAMMER.

The Remington drop hammer, the cut of which appears on this page, is of that class in which the hammer is raised by a stiff belt or board passing up between two friction rolls, and is so well known that we only describe the improvements.

These consist in the lifting arrangements being detached from the upright ways, and in such a manner that the lifter gets no jar from the hammer, as it does in other drops. The lifter is made of a peculiar style adapted to this class of machines, very strong in all its parts. The friction rolls running parallel with each other are keyed strongly on a three inch shaft, and run in fixed bearings. One of the shafts is turned on an eccentric, and on the end of this there is a shackle or adjustable lever, which is connected with a rod which runs down by the ways, and is connected with the base. On this rod are two clamps, which are easily adjustable, to vary the height of the hammer, in order to give a light or heavy blow. An automatic trip is connected with the catch bar in such a manner as to enable the operator to readily give any number of blows he may require, and at the same time have free use of his hands. The lifter can be used with any other drop. For further information address E. Remington & Sons, Ilion, N. Y.



REMINGTON DROP HAMMER WITH DETACHED LIFTER.

During the gales of the 26th and 27th of Jan., unprecedented wind pressures were experienced at the Forth Bridge works. Mr. Benjamin Baker reports that the strongest gusts gave a momentary pressure of 35¼ pounds per sq. ft. on a large board, 300 sq. ft. area, and no less than 65 pounds per sq. ft. on a small board, containing 1·5 sq ft.

IMPROVED STEAM ENGINE.

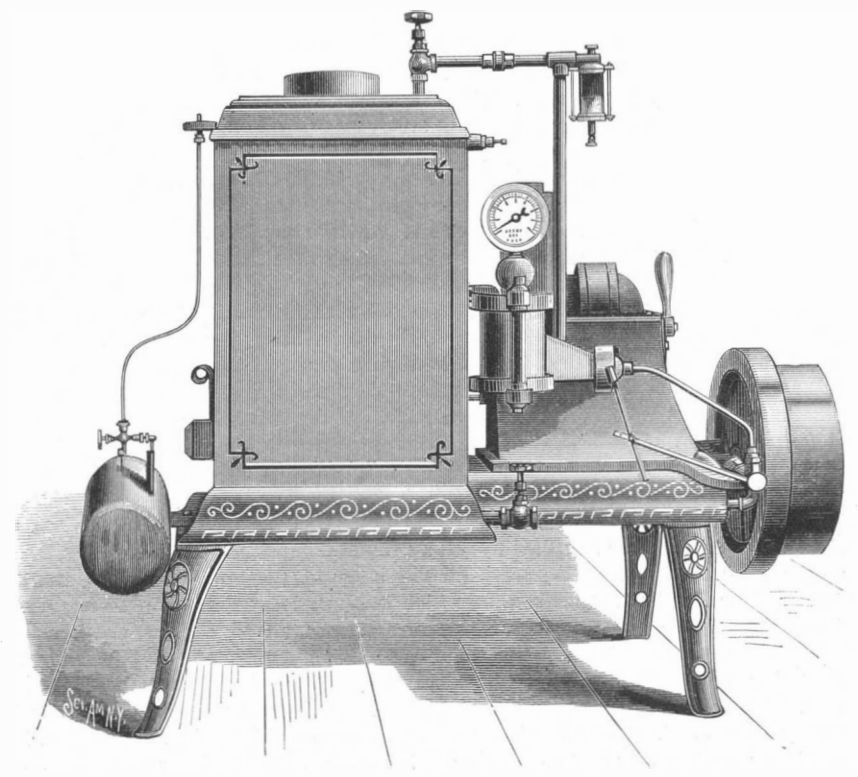
The annexed engraving shows a compact and light steam engine and boiler of simple construction, manufactured by Mr. A. H. Shipman, of Rochester, N. Y. The boiler is made from cast iron sections, having wrought iron tubes screwed into them, and bolted together. Radiation is prevented by double jackets of sheet iron having an air space between them. An intense blast of fire is formed by pressure of air or steam flowing through an atomizer which throws a fine spray of kerosene into a fire box in the boiler, the fire being so placed as to be completely surrounded by water. This plan insures the combustion of all the oil, does away with smoke stack, and utilizes the heating power of the fuel. A diaphragm controls the fire, so that an even pressure of any desired amount can be carried at all times. As the pressure in the boiler increases, the diaphragm closes, and the amount of steam admitted to the atomizer diminishes accordingly, thereby regulating the quantity of oil burned.

A lowering of the pressure produces a contrary effect, and the fire is increased. The tank of oil can be kept at any distance from the engine and brought to it by a pipe. An automatically regulated pump, with plunger connected direct to main shaft by an eccentric, keeps the boiler constantly supplied with the proper quantity of water. The engine is placed in close proximity to the boiler, so that loss resulting from the use of long connections is avoided.

The cylinder and its parts are inclosed in a steam tight box in which the steam exhausts. This keeps the cylinder hot, and insures the complete oiling of all the parts.

The engine has two cylinders, with steam chest between them, and two piston heads, one to each cylinder, connected with a small rod. The pistons are hollow, and as the movement is vertical there is no friction caused by their weight. The lower piston head is connected with the pitman, which is attached direct to the main shaft, no crosshead or slides being used. The valve is balanced. A governor acting direct upon the valve is applied to engines for stationary work.

The engine is especially designed for propelling small boats because of its small size, light weight, little attention required and the small amount of room needed for storing fuel; when it is to be used for this purpose it is made reversible. The engine shown in the cut is furnished with a balance and band wheel for stationary work.



SHIPMAN'S IMPROVED STEAM ENGINE.

Building up Milling Tools.

If a solid mill intended for dressing a width of six and sometimes eight inches is broken at any portion of its length, its usefulness will be impaired by so much as the break removes from the teeth their cutting surface. No remedy exists but annealing, turning down, recutting, and rehardening. Consequently, built up mills, are used for wide stretches, disks of three-quarters of an inch thickness, or less, being placed side by side on the same arbor and held by a set-up nut. If one of these breaks a tooth, it is a matter of slight consequence compared with the loss when a long mill breaks; the broken disk may be removed and a whole one substituted.

But these built up mills leave necessarily behind them narrow uncut ridges, showing where the disks met side by side, and thus making imperfect work. An ingenious device has remedied this defect and made the built up milling tool as perfect in the results of its work as the solid and expensive mill. The sides of the mill disks are cut into radial projections to the depth of the teeth, an alternate projection to an alternate depression—understood by recalling the old-fashioned shaft couplings cast with lugs on their engaging sides, so that they locked together. By this method of forming the mills any number may be placed on a spindle, or arbor, and interlocked, making a solid mill that will leave no circumferential tracks on its work.

This mill has another advantage. Inside the circumference of alternate projecting teeth is a turned and finished portion extending from the center hole out to the root of the teeth, forming the solid bearing of one disk against those next to it when they are assembled and set together with the common binding nut.

If two disks side by side make a cut exactly one and a half inches wide, which it is desirable to widen to one inch and nine-sixteenths, this may be done by introducing "skims" or washers of paper without impairing the face continuity of the built up mill.

How to Increase the Temperature of Furnaces.

There is one application of gas as a fuel which was discovered by Mr. Fletcher two years ago, but is not generally known. This is the addition of a very small quantity of coal gas or light petroleum vapors to the air supplied by a blower or chimney draught to furnaces burning coke or charcoal.

The instant and great rise in temperature in the furnace, and the great stability of the solid fuel used, are extraordinary.

This is in fact, a practical application of the well known flameless combustion, the only sign that the gas is being burnt being the great rise in temperature and a decreased consumption of solid fuel; indeed, solid fuel is not necessary.

To polish tarnished nickel, use chalk or rouge mixed with tallow.

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How to Raise Early Flowers from Seeds.

The season is approaching when every one interested in gardens feels the desire to begin operations. The weather for the next thirty days will allow little to be done out of doors in this latitude, but much may be done in doors, both in flowers and vegetables, cheaply and simply, by sowing seeds. No horticultural occupation is more interesting than that of sewing seeds to produce plants for resetting in the open ground when the season is warm enough.

All the leading kinds of flower seeds can be bought for five dollars. A writer in the *Evening Post*, who evidently has a practical knowledge on the subject, gives the following directions: The best way of sowing seed is not in flower pots, as is too often done; these are too porous and dry too quickly, particularly in the atmosphere of a sitting-room, where the air is necessarily much drier than in the greenhouse or hot-bed. Our best florists no longer sow seeds in earthenware, but use shallow boxes instead. Common soap boxes, cut into three or four pieces, making a depth of not more than one to two inches for the soil into which the seeds are to be sown, are convenient. Of course any size of box will do, but it should not be of greater depth than two inches, otherwise the soil will get too wet, and become sour. Care must be taken that the bottom of the box is left open sufficiently to allow the water to escape when given in excess. Almost any good soil will suit, which, for convenience, had better be procured from a florist.

After placing the soil in the boxes make the surface perfectly level and smooth, then sow the seed evenly over it, press it into the soil, and cover it. The rule is that all seeds should have a covering of soil equal to the size of the seed.

When covered, water gently with a fine rose watering pot; this one watering will usually be sufficient until the seeds come up; in any case, the soil should not be again watered until, by its light color, it shows indication of being dry. Although seeds will germinate in the dark, the moment that they break the surface of the soil they should be placed in the lightest possible place.

The temperature best suited to the germination of nearly all seeds is about 60° at night with 70° during the day. After the seeds have started to make the rough leaves, they should be replanted from the seed boxes into similar boxes at distances from an inch to an inch and a half apart, where they can remain to be set out in the open ground, from the middle to the end of May.

It is very important to get the proper kinds of flower seeds, because there are hundreds of varieties offered in the seedsmen's lists that it would be useless for the amateur to attempt to cultivate. For want of discrimination in selection, much disappointment ensues. The kinds recommended to give the most general satisfaction are asters in variety, balsams (camellia flowered), candy tuft in variety, cockscombs, chrysanthemum, tri-color, coleus, convolvulus, cypress vine, geraniums, marigold (gold-striped), mignonnette, pyramidal and spiral, pansy in variety, Phlox drummondii, petunia, single and double, stocks, verbenas, and zinnia.

Another plan, very satisfactory with amateur gardeners raising flowers, is to purchase very small plants from the florist about the first week in April, which at that season can be had at about one-third the price they are sold for in May. These plants are shifted into pots a size larger, and can be kept in the sitting-room where there is plenty of light. By the time of planting out in May they will have grown to be large and fine plants. They will require but little care. The kinds of plants best suited for summer flowering that can be safely grown in the sitting-room are begonias, chrysanthemums, carnations, geraniums of all kinds, fuchsias, heliotrope, and monthly roses. There are many others, of course, but these are the simplest and such as will be most satisfactory.

A tea rose that bids fair to be a treasure is the "Mme. Ched. Gunniroisseau," a monthly, of magnificent yellow tint, something like the "Isabella Sprunt," only much finer.

Unconscious Bias in Walking.

Mr. G. H. Darwin, in *Nature*, states that some ten years ago he made a few experiments upon the subject of "Unconscious Bias in Walking." He began by walking himself, and getting various friends to walk, with eyes shut in a grass field. All walked with amazing crookedness in paths which were not far removed from circles. Two of the circles described were not more than fifty yards in diameter, although the pedestrians thought they were going straight. All diverged to the right excepting one, who was strongly left-handed.

"I then got eight village schoolboys, from ten to twelve years of age," continues Mr. Darwin "and offered a shilling to the boy who should walk straightest blindfold. Before the contest, however, I dusted some sawdust on the ground, and after making each of the boys walk over it, measured their strides from right to left and left to right. They were also made to hop, and the foot on which they hopped was noted; they were then made to jump over a stick, and the foot from which they sprang was entered; lastly, they were instructed to throw a stone, and the hand with which they threw was noted. Each of these tests was applied twice over.

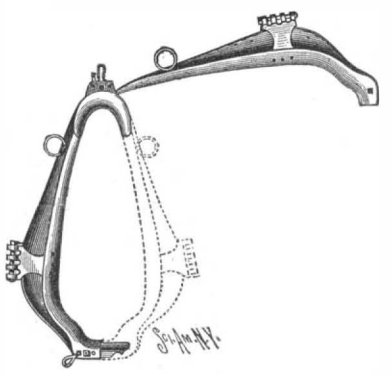
"I think they were all right-handed in throwing a stone, but I believe that two of them exhibited some mark of being partly left-handed. The six who are totally right-handed strode longer from left to right than from right to left, hopped on the left leg, and rose in jumping from that leg. One boy pursued the opposite course, and the last walked irregularly, but with no average difference between his strides. When I took them into the field, I made the boys successively take a good look at a stick at about forty yards distance, and then blindfolded them and started them to walk, guiding them straight for the first three or four paces. The result was that the left-legged boys all diverged to the right, the right-legged boys diverged to the left, and the one who would not reveal himself won the prize. The trial was repeated a second time with closely similar results, although the prize winner did not walk nearly so straight on a second trial.

"I also measured the strides of myself and of some of my friends, and found the same connection between divergence and comparative length of stride. My own step from left to right is about a quarter of an inch longer than from right to left, and I am strongly right-handed."

Mr. Darwin believes that nine out of ten strongly right-handed persons are left-legged, the reason being that every active effort with the right hand is almost necessarily accompanied by an effort with the left leg, and a right-handed man is almost compelled to use his left leg more than the other.

IMPROVED STEEL HORSE COLLAR.

The accompanying illustration represents a horse collar manufactured by the Steel Horse Collar Company, of Fitchburg, Mass. It is provided with a hinge at the top and a spring latch at the bottom, which instantly locks the collar on the horse when the sides are pressed together. The rapidity with which this collar can be securely fastened has recommended its use in a great many fire departments throughout the country, and praise in its favor has been general. The collar is strong, light, and durable, and presents a very neat appearance, being made of steel, and as no hames are used, the weight on the animal's neck is much reduced, and the liability of sore necks lessened. It has a uniformly smooth surface, and always keeps its perfect shape. It being a good conductor of heat, scalding of the skin of the animal is obviated. The collar and pad are



IMPROVED STEEL HORSE COLLAR.

covered with zinc, which has a healing effect, and it is claimed that sore necks and shoulders can be healed under this collar while the animal is continuously at work.

This collar is well adapted for the use of canal men and farmers. The draught on a tow line or plow team being continuous generates excessive heat on the animal's shoulder, which soon produces sores. The same collar can be fitted to horses with necks of different sizes and shape, as each collar is adjustable at the top and bottom. Pressure upon the windpipe and the possibility of choking are prevented by the shape of the collar at the bottom. This collar has been thoroughly tested in extreme hot and cold wet weather, and for light and heavy draught, and it has given good results and is highly spoken of by those using them.

Doctors and Disease in Central Asia.

Among the peculiar diseases which prevail in Asia there are three which are interesting from the limited area they infest, viz., the *rischta*, leprosy, and the sartian sickness.

The *rischta*, thus designated by the natives of Turkestan, is a nematoid worm belonging to the family of the filarides. It is peculiar to many places in Turkestan and Bokhara. The cities of Djizak and Karchi abound in it; it is found elsewhere, but in far fewer numbers. The disease itself is caused by the presence under the skin of a worm which sometimes attains the length of 90 cm. At this point a red tumor forms, from the apex of which emerges a white spot, which is the anterior extremity of the worm. The disease is sometimes accompanied by fever symptoms, pains in the bones, and a general swelling of the part attacked. The rischta buries itself by preference under the skin of the hands, arms, or legs. Abandoned to itself, it slowly comes out from its retreat, but takes many weeks and usually is ruptured, suffering a group of smaller worms to escape in the wound. The disease is then greatly aggravated, for the whole brood of embryos secrete themselves in the surrounding muscles and tissues, where it is very difficult to destroy them.

The only method of radically curing the disease is to destroy the worm as soon as he makes his appearance in the abscess. The native doctors are very skillful in performing this, and rarely fail to effect a cure. The *Tabib* for this purpose takes a needle, and raises the skin around the diseased spot over an area of many centimeters. Then enlarging the wound, he passes his lancet beneath the worm, which he raises, while he catches the free extremity of the rischta in the fork of a little stick of wood slit at the top. Pushing from below up with the lancet, and rolling the worm around the stick according as he disengages himself, the doctor succeeds in extirpating the parasite in less than two minutes. Sometimes many individuals are lodged together in the same spot.

The rischta passes its early life as a cyclops or small crustacean in stagnant water. The second phase of its existence is completed in the human body. The cyclops imbibed in drinking passes into the alimentary canal. Here the reproductive organs of the worm are developed, and fecundation follows. The males die, and the pregnant females traversing the walls of the digestive tube follow the blood capillaries and finally lodge in the subcutaneous tissues.

The rischta is the result of sewage contamination. The cities of Turkestan are supplied with water from innumerable canals called *aryks*, which traverse the cities in all directions and become receptacles and conduits of sewage. This water is never drunk by Europeans unless filtered or boiled, and they consequently suffer less from these loathsome troubles.

The sartian malady, known in a great number of places under a variety of names, consists in the formation of excrescences, generally only one, rarely many in the same place, and appearing ordinarily upon the hands or face. These tubercles secrete a serous liquid, then cover themselves with a white crust, while they increase in size, invading a larger portion of the patient's body. They cause no pain. The disease is cutaneous, not attacking the bones or the mucous membrane. Left to itself it disappears at the end of a period more or less long, leaving, however, deep scars, and sometimes removing the side of a nose, a portion of a cheek, or an end of an ear. It is a frequent occurrence to encounter in the streets mutilated figures. It arises from the contaminated and impure water. It attacks women more readily than men. Fortunately the native doctors are learned in its treatment, and effect cures without causing disagreeable scars. They employ pomades or unguents, into the composition of which there frequently enters sulphate of iron, honey, vinegar, oil, oxide of lead, cantharis probably, etc.

The most serious endemic disease of these countries is leprosy. It attacks, however, only a limited number of individuals. The regions nearest to Turkestan where lepers are found are the Caucasus, Lower Volga, Don, and Crimea.

In Turkestan there can be seen three characteristic forms of leprosy: the tuberculated, spotted, and anestherique. Leprosy is a constitutional chronic malady which especially affects the mucous membranes and the skin, producing either red, yellow, brown scaly spots or pustules or tubercular or diffuse infiltrations, ulcerous or not, and frequently leading to the loss of the organ attacked.

Leprosy can be cured to-day by hygiene, hydropathy, and galvanism, but in Central Asia no cure is known for a leper, and every individual attacked is consigned to a death more or less slow. In 1869 Dr. Saveljeff found twenty-nine inmates of a leper refuge near Tachkent. Almost all were covered with the characteristic scales. Some had pustules upon the hands and upon the body; others were blind. With four of them the disease had made the fingers and toes fall from the hands and feet; another was a monster; all attacked in various degrees. The traveler will find them at the gates of the cities, waiting for some passer-by to take compassion on them and give them alms—a sad, wretched group of huddled and beseeching victims.

Most frequently they unite their miseries, inhabiting the same place, generally the leper refuges. These quarters or establishments are veritable ghettoes, with no communication with the inhabited regions round about.

One can imagine the miserable life led by these unfortunates. Prey to corporal torments sometimes terrible, reduced to live upon public charity, despised, isolated from all the world, dead before the end of life, hopeless, and in beggary. This picture, however, is overdrawn. The interval between enjoyment and suffering is not a great one among barbarous peoples; they have fewer needs, and soon attain a personal contentment not very intense or enviable. In the same way, their ills are not so insupportable. And even the lepers in their miserable fellowship and absolute relief from all civil duties seem to experience a certain sort of satisfaction.

The cause of leprosy has never been defined clearly, and in general terms is assigned to climatic terrestrial influences favoring its development. Turkestan is a favorable nidus for the nurture of this horrible complaint, and those who wish to study its etiology should visit the regions of Central Asia, where its manifestations are various and where it exists in an unmodified form. It has been averred that leprosy is not hereditary. It certainly is so in Central Asia, where the offspring of lepers fall almost invariably victims to its horrible ravages.—*From Revue Scientifique.*

Compressed Air Locomotive.

Col. Beaumont, whose many successful mining locomotives hauled by compressed air are now extensively used in Europe, states as one of the results of his practical experience that one cubic foot of air under a pressure of 1,000 pounds to the square inch will take a load of three tons for one mine on any of the colliery tracks.

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Correspondence.

Snake Swallowing its Eggs.

To the Editor of the Scientific American:

Noticing the article in March 8 issue of your valuable paper concerning "Curious Facts about Snakes," I am prompted to pen an experience of my own in same field, which occurred a few years ago near Mystic Bridge, Conn.

While picking whortleberries—must have been in July or August—attention was called to the exposed side of a large adder in the dry oak leaves.

The head and most of the body were hidden. After being killed by a stone's blow, her unusual size in circumference prompted further investigation. Inside were found a number of "wee" snakes—a dozen or so—quite well developed, which, though possessing power to advance slightly by quick wave motions, yet gave *unmistakable signs of having been swallowed from the nearly developed egg itself with entire contents.* Portions of the yolk, unseparated from the little ones, coupled with the fact that one of the small snakes showed far less development than its brothers and sisters, (in fact, was either deformed or needed a longer period wherein to absorb the sustenance from the yolk still constituting a *large* part of its organization), led me unhesitatingly to the conclusion that the instinct of the mother had led her, at about the season of development, to the place where the eggs were deposited, and she had then swallowed their contents. Growth and development would have there continued till the offspring first saw light at the mother's throat. What more natural than that the little fellows find their way back down the throat for protection!

Imagination is not being tested when recording this observation. I am assured, if similar observation has never been recorded previously, future search will prove it true.

Perhaps all kinds of snakes may not do thus. The matter is worth some trouble and search.

JOHN S. PALMER.

Texarkana, Ark., March 11, 1884.

Snake Swallowing its Young.

To the Editor of the Scientific American:

In your issue of the SCIENTIFIC AMERICAN March 8, in an article on "Snakes," the fact of "mother snakes" swallowing their young is spoken of as something unusual.

Some years since while hunting I came across a striped harmless snake about 3 feet long, common in this part of Iowa, with two small snakes protruding from her mouth about two inches. On closer observation five others were discovered near her head on the ground, each about five inches in length. My curiosity being aroused I drew near, when she immediately proceeded to pick up each of the other five *by the tail* singly, at the same time swallowing down the two whose heads projected from her mouth, until she swallowed them all, usually there being two on the way down at the same time.

Disturbing the last two by presenting a weed to their heads, they bid me defiance by darting forth their little red tongues, showing all the spirit of their kind, and slowly retreated down their mother's throat. On killing the mother snake about a dozen in all were found in her throat and stomach.

J. G. RATCLIFFE.

Waukon, Iowa.

WATER BASIN IN ARIZONA.

The dry, hot southwest winds devastating successively New Mexico, Western Kansas, Nebraska and portions of Dakota suggest the idea whether it would not be possible to create an artificial basin or body of water somewhere in New Mexico or Arizona, the evaporation from which would mitigate the effects of the hot winds in the States aforenamed.

Some years since I read that Gen. Fremont had some such scheme projected. Has it ever been proved to be practical?

J. G. R.

Interesting Facts about Platinum Wire.

To the Editor of the Scientific American:

In your issue of March 22, you state that platinum wire fine enough for cross hairs of telescopes is too weak to handle successfully. Dr. Wollaston published in 1813 (Philos. Trans.) an acount of his making the wire $\frac{1}{18000}$ inch diameter. Our Mr. E. W. Arms has, since the fall of 1876, handled large quantities of it, as shown in hundreds of transits and levels now in use. The size ordinarily used for field transits is platinum wire of 0·003 inch, covered with silver to 0·1 inch; this drawn to 0·003 inch will leave the platinum, when the silver is dissolved off, to be 0·00009. This wire will sustain a weight of four grains or a ball of wax the size of a pea.

W. & L. E. GURLEY.

Troy, N. Y., March 21, 1884.

Spring Floods and the Sewers at Cairo, Ill.

To the Editor of the Scientific American:

Our city, as many of your readers know, is surrounded by levees to protect us against overflow during high water. The flood month is February, and we then have generally the heaviest rains of the year, which sometimes raise the water inside the levees; during this time our sewers have to be closed to a rather uncomfortable height. Now, during high floods, a current of water passes our sewer outlets at the rate of from 5 to 7 miles per hour. Could not one of your many readers suggest through your valuable paper some way how to best make use of this current, to relieve us of the water gathered inside the levees? Has such a thing as a siphon or suction created by the current been used anywhere?

Our highest water rises to about 15 feet above the sewer outlets.

JNO. A. MILLER.

Cairo, Ill., March 20, 1884.

The War against the Patent Laws.

To the Editor of the Scientific American:

The interest which is now exciting the discussion upon the importance of scrupulously guarding our patent laws against the machinations of a combination of railroad sharks, rule or ruin grangers, and our ignorant and reckless Congressmen, may eventually be the means of casting a ray of light into the dark corners of the craniums of some of these would-be figure heads. It is said figures won't lie, yet they may be so arranged as to completely misrepresent the truth.

In regard to the best interest of the railroads, it is susceptible of demonstration that they are only conniving at their own ruin in their efforts to destroy the protection now given to inventions.

We have just returned from a tour on which we visited some of the most extensive manufactories of agricultural machinery at Dayton and Springfield, Ohio, where unusual opportunity was offered for comprehending the character and magnitude of the business there conducted in the manufacture of every machine used by the farmer, for cutting the furrows, pulverizing the soil, depositing the seed and fertilizers, cultivating, harvesting, and thrashing the crops.

And although it has required half a century of the slow but patient, unceasing efforts of hundreds of thousands of earnest workers, morally and physically, to bring these machines up to their present state of perfection, the substance of the whole history may be condensed into the space of a nutshell and expressed by a few words—the stimulus offered by the patent laws, giving ownership to the inventor in his own creations, did it all.

Of the vast manufactures of Springfield, the first in order in magnitude and productive capacity are the Champion Mower and Reaper Works, of which there are three distinct plants. The Whiteley, Fassler & Kelley, the most recently erected, claims first rank, presenting a continuous and uniform frontage parallel with the railroad track for eleven hundred feet, and nearly as far at right angles, being in form of a hollow square.

The external aspect of the massive structure will suggest to any one that something more than usual is going on within.

It will suffice to say that the combined operations of the three works result in turning out a complete reaping machine in the space of one and two-thirds of a minute, during the ten working hours of the day.

An inspection of the wilderness of mowing machinery shows that it has come from the most reputed builders of the country. The entire equipment, almost, of the machine shop is from the Pratt & Whitney Co., Hartford, Conn., and the woodworking from equally distinguished manufacturers, which is a guarantee of the superior character of the work turned out by these factories.

When fully completed, these works will supply from the ore all the steel used in their works.

The old and original Champion Works, which stand near the heart of the town, are hemmed in so that no expansion is possible, while the third works, at Lagonda, a mile out, are on a scale corresponding with the first.

The trains of cars which are continually being loaded with these machines to be distributed throughout the States and Territories, while many train loads are taken to the shipping ports to go to foreign countries, should convince any one that the railroad owners were having a good thing of it, and it would be expected that their sympathies were with these manufactories, but, strange to have to say, such is not the truth.

These works constitute but a fraction of the productive power of Springfield. In the article of horse rakes, Springfield and its neighbor town, Dayton, annually aggregate some sixty-five thousand machines; and allowing one hundred and ten machines to the carload, nearly six thousand cars are required to convey this special kind of goods to their destination, while many train loads are shipped to foreign countries.

To bring the raw materials to these factories furnishes employment to a much larger number of cars, to say nothing of the thousands of tons of coal and other articles consumed directly and indirectly by the army of operatives in and about these works.

And when we take into the account the combined products of these factories, and their dependence upon the transportation facilities of the country, and the endless sources of revenue it affords to them, it would seem nothing short of madness on the part of railway owners to in any way restrict their protection under the patent laws.

In further illustration of the fostering influence of patents, since last harvest three new plants for three large industries have sprung up in the town of Springfield, on locations selected to secure unrestricted bounds for expansion from a future growth of solid business. These men have been induced to invest their capital from the successful operations of the old establishments, which have been producing the same line of goods.

But the first step was to secure the control of patents which would protect them in the business, and thereby render the investment secure; and without this reliance upon the plighted faith of the government or its servant these millions of investment would not have been made. This single instance will illustrate the history of the thirty odd manufactories at Springfield; those of Dayton as well.

Now, the inevitable result which must follow the criminal course being pursued by the railroad corporations and our blind and reckless Congress will be to give the privilege to whoever chooses to take these perfected machines for patterns, go further West, where the supply of materials is cheap and inexhaustible, set up business, and in a short time supply the customers of our factories at lower prices than it will be possible for them to do; and the railroads will have only the business of hauling the finished work, and will be relieved from hauling the raw materials, which now is worth more to them than that of transporting the goods.

Can any candid, reflecting, well-disposed man look these facts squarely in the face, and then say there is no truth in them?

It is acknowledged by all civilized people, that he who has succeeded in supplying the means with which his fellow men can accomplish a greater amount of work, and that in a better and cheaper way than it was possible to accomplish the same previous to the use of his method, is the benefactor of his race; while he who attempts without authority to take that from his fellow man which is rightfully and justly his own property, is acknowledged by all civilized people to be a thief.

S. L. DENNEY.

Strasburg, Lancaster Co., Pa., March 26, 1884.

Hand and Machine Made Putty.

How the two kinds are made, and the difference between them, is related by an old painter to the ubiquitous reporter as follows:

The best is made of raw linseed oil and whiting, the latter being simply chalk, ground in a mill like flour. It comes out with a fine flint grit in it. Before making putty of it, a few old fashioned men who believe in making the best of everything, wash the grit out. The fine flour is then dried. If it is not dried perfectly, it takes up more oil than is desirable or profitable. From 500 to 600 pounds—about 15 per cent. by weight of raw oil to 85 per cent. of whiting—are put in a chaser and thoroughly mixed. The chaser is an annular trough, 10 feet in diameter. From a vertical shaft in the center two arms extend, on the ends of which are heavy iron wheels that rest in the trough. When the shaft revolves, the wheels chase each other around the trough. When mixed, it is packed in bladders for convenience in handling. The adulteration of putty is effected by mixing marble dust with whiting. It costs about a quarter of a cent a pound, and whiting costs twice that. Paraffine oils, at from 20 to 30 cents a gallon, are used instead of linseed oil at 60 cents. The marble dust makes the putty gritty, and the cheap oil makes it sticky. Cheap putty is decidedly cheap. Putty in bulk, wholesale, is worth $2.12 a hundred pounds. The other window glass cements run from $1.40 to $1.75. They are dear at that. They take longer to put on and longer to dry. Putty is neither imported nor exported. A lot was brought over a long time ago, but that was when oil was very high. The whiting comes from England.

A superior article of putty is made, however, by the further addition of white lead in oil, japan varnish, and a small quantity of turpentine, which makes a hard cement that does not shrink, and when dry can be rubbed down with pumice stone or dusted with sand paper, so smoothly will it cut, Even in the common sorts of putty it is well to use some white lead if a hard putty is desired.

"Creditable and Serviceable Modern Cruisers."

In such language does the President refer to the vessels now approaching completion, as a step in the "reconstruction of the navy." The severe criticisms made upon the plans of the new cruisers are not ignored, but the "character, experience, knowledge, and skill" of the designers are thought to weigh a good deal against these criticisms, and the President thinks it would be "an act of national imprudence" to relinquish or postpone, on account of the criticisms, the building of substantial additions yearly to our present navy. The finishing and armament of the monitors already under way is likewise urged upon Congress, as are also the recommendations of the Gun Foundry Board for promoting the production of material for heavy cannon at private steel works, and that two government gun factories should be established—all as being demanded by "considerations which concern the national safety and honor."

The Keely Motor Stuck Again.

Keely's first week of solitary confinement with his motor, for the purpose of "focalizing and adjusting the vibrators," has resulted, not in the single revolution which is to demonstrate his final triumph, but in another postponement. We learn from one of our contemporaries that the stockholders met in Philadelphia on the 26th, and waited with great excitement for a report from Keely. He sent word that the "focalizing" was making rapid progress, that he was too busy to leave it even for a moment, and that they could fix a date for exhibition on or before April 10. Then the stockholders separated, cheerful and hopeful as usual.

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THE NEW DYNAMITE GUN.

Ever since the introduction of what are known as high explosives, some means have been sought by which they could be thrown from guns with accuracy, and a sufficient distance to render their use practicable for purposes of war. The nature of dynamite and nitroglycerine precludes their being loaded in cannon and fired in the ordinary manner by gunpowder, which has been proved conclusively in many ways, and has almost invariably led to the destruction of the gun in which the attempt was made.

Thus far the application of high explosives has been principally confined to torpedoes. These latter in their various forms have attracted a great deal of attention, different governments spending large sums in maintaining and perfecting them. The various systems, while undoubtedly advantageous in a great many cases, are, nevertheless, restricted in their very nature, and this has stimulated investigators to devise means by which high explosives, such as dynamite, could be projected "overland" with safety.

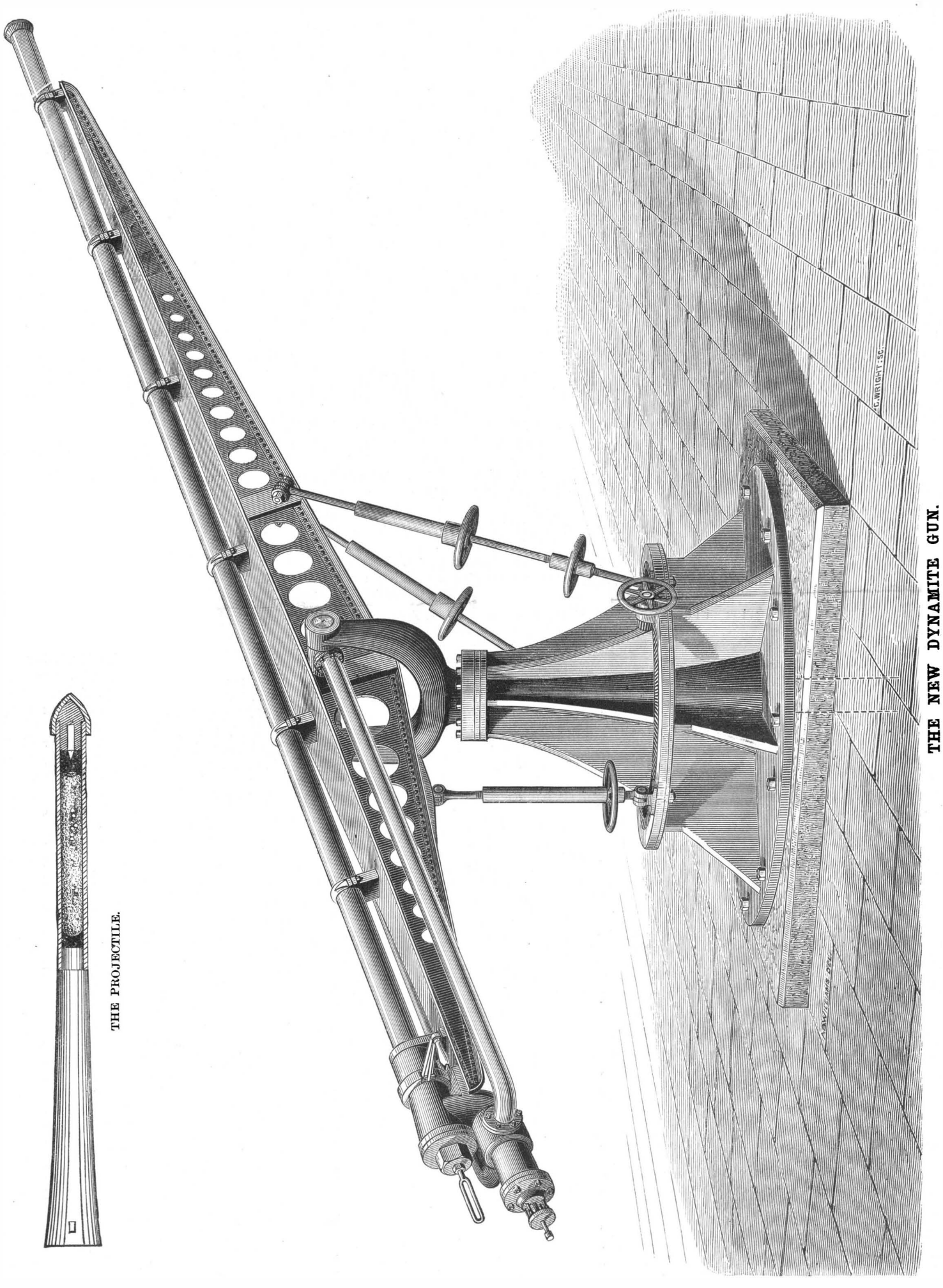
It is now claimed that this knotty problem has been put in a fair way of being solved, and, strange to say, by a medium long since applied to the propulsion of projectiles, but the use of which has never yet been attended with sufficient success to warrant its permanent introduction. We refer to the use of air and steam under high tension, and in the new dynamite gun compressed air of very high tension is used as the propelling power.

This new gun is the joint invention of a number of men under the leadership of Mr. H. D. Winsor, of New York, and one form of it is now undergoing a series of tests ordered by the Government, which are being made under the special direction of Lieut. E. L. Zalinski. In the mean time a description of the apparatus will be interesting as illustrating a new departure in appliances of war in a direction which has heretofore proved unsuccessful.

Our illustration represents the 4 inch gun which is now building at the Delamater Iron Works, New York, and which embodies the latest improvements. It will be seen to consist of a tube, 40 feet in length and ¼ inch thick, mounted upon a light steel girder. The latter is trunnioned and is pivoted on a cast iron base, thus enabling it to be swung into any desired position and range. To assist in the latter operation guys are placed on either side of the base, and their length can be altered and fixed by turning the hand wheels shown.

Compressed air is introduced to the gun from below and passes up through the center of the base, the pipe connecting with one of the trunnions (which are hollow); it is thence introduced into the pipe shown at the side of the gun leading into the valve. This valve is a continuation of the breech of the gun, to which it is connected by the short passage shown.

An important feature of the system is the projectile, or dart, and upon which the success of the undertaking greatly depends. By referring to the illustration it will be seen to consist essentially of two parts, and while several different modifications have been tried, the principal features are alike in all of them.



THE NEW DYNAMITE GUN.

THE PROJECTILE.

The forward part of the dart consists of a thin brass tube, into which the charge of dynamite is inserted. At the rear, the tube is closed by a wooden plug, which flares out toward the rear until its diameter equals that of the bore of the gun. The forward end of the brass tube shows a mass of some soft material, into which is inserted a pin firmly held in place, the end being closed by a conical metal cap. Provision has also been made to allow a certain amount of air to act as a cushion for the dynamite cartridge, thus lessening the shock due to a sudden discharge. It is therefore claimed that, under ordinary circumstances, there is little danger of the charge exploding, since the pin cannot reach it and ignite the fulminate at its end; but when thrown from the gun the impact against a body will displace the soft material and drive the pin home, causing an explosion.

Another feature of the projectile is the power which it possesses to correct, to a certain extent, the deflection due to a side wind. It will be noted that with the present construction the center of gravity of the dart is some distance forward of its center of figure. A side wind would, therefore, acting upon the lighter rear part, have the tendency to deflect it so as to turn the head of the dart into the wind, which action would, in a measure, tend to keep it in the line of its trajectory. The firing of the gun, if the expression may be used, is accomplished in the following manner: The dart is inserted in the breech, and a gas check placed in position; a lever then being moved, the valve is opened, and the air pressure admitted.

This method of discharge will, it is thought, obviate the danger of shock, which had heretofore proved a stumbling block to success, and in addition the valve controlling mechanism is automatically arranged to admit the air gently at first, to overcome the inertia of the projectile, following with full pressure, and finally closing at the proper time, as the dart leaves the gun.

It will readily be seen that, if this gun prove successful, a great step in advance will have been made, and one which will work great changes in warfare, both naval and military. As an auxiliary to coast and harbor defences such a gun would be of great value; and placed on board small launches the latter might approach and hurl their deadly missiles with great accuracy, the absence of a loud report and of a flash of fire giving additional security from detection. Another advantage of these guns is their cheapness; their cost is but a trifle compared with that of other guns of equal power of destruction; and whereas the latter require heavy special machinery and many months of labor to complete them, the former can be built in any well equipped shop in a period of time not exceeding a month, if need be. Nor does it seem unlikely that the system may be applicable to the use of armies in the field when engaged in siege operations.

Experiments made thus far have shown that the apparatus can be depended upon for a fair degree of accuracy and rapidity in firing. As regards the range attainable, the two inch gun now being tested has attained 1¼ miles with a pressure of 420 pounds to the square inch. In the four and six inch guns which are in course of construction, it is intended to use pressures of 2,000 pounds and over, by the use of which a range of three miles is hoped to be attained.

While this new application of compressed air to the pro-

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pulsion of dynamite is no doubt valuable, it is hardly to be expected that it will, with its limited range, ever take the place of heavy ordnance—a point which its inventors wisely do not claim; but if it shall transpire that the gun is, in itself, a practical success for much shorter distances, it will be of the greatest importance and a valuable accession to our present appliances of war.

Especially will this be so in this country, where our coast line is so extended, where good harbors are so numerous, and appropriations for harbor defense so meager and so often *nil*, and where in fancied security we expose our defenseless shores to hostile invasion; under these circumstances does it become necessary for us to substitute cunning for might, and rely upon some such means as torpedoes and dynamite guns to protect us from unexpected and uninvited approach.

Basket Willow.

E. H. McJ. asks what is basket willow, and where can it be obtained? A. It is a species of the genus *Salix* that is popularly known as swamp willow, or osier. For basket purposes the stump or stool is kept down by the cutting of the shoots annually, which are the portions used in basket making. It may be obtained in a wild state, being identical with the native pollard willow, or cuttings may be got from any reliable nurseryman.

About twenty-five years ago Col. Samuel Colt of revolving pistol fame reclaimed from the overflows of the Connecticut River, at Hartford, Conn., a vast area of land by means of extensive dikes which now form a portion of the street geography of the city. Within the area thus reclaimed he built his enormous factory and villages for his workmen. To protect the banks of the dikes from the action of the river currents and the destroying influences of rains and melting snows, he planted them thickly with osiers—the basket willow — and cut, or rather mowed, the shoots every summer with the intention of sending the vigor of the plants into the roots, so as to bind the inclined surface of the dikes in one mass. The result was just what was expected as to cohering the particles of the banks, but it forced the consideration of the utilization of the shoots annually cut away.

To do this, Col. Colt imported Swiss basket makers, built a collection of Swiss-fashioned cottages for them, and for several years (until his death) carried on the business of willow basket making. This industry has since ceased, but the osiers still grow in great luxuriance. The sides of the Colt dike in Hartford contain enough of osiers to plant hundreds of acres, as all that is necessary to insure growth is to insert a cutting in ground that is not absolutely dry.

The Maple Sugar Season.

It is so easy to adulterate maple sugar with cane sugar, or maple sirup with glucose, that those who really care for the genuine article find it rather difficult to get. This was notably the case last year, when the weather was not propitious for a good yield of maple sap. The best conditions for a good sugar season are found when the ground has been deeply frozen by a severe winter, followed by a spring which commences to open early, but gives several weeks of alternate freezing and thawing, before the frost is all out of the ground. Weather when it freezes quite sharply at night and thaws freely during the day, always gives a good "sap run." The following tables show the yields of maple sugar in the principal sugar producing States for the years 1870 and 1880, as given in the census reports of those years:

	1870. lb.	1880. lb.
Vermont	8,864,302	11,261,077
New York	6,692,040	10,693,619
Ohio	3,469,128	2,895,782
New Hampshire	1,800,704	2,731,745
Michigan	1,781,855	3,423,149
Pennsylvania	1,545,917	2,866,010
Indiana	1,332,332	235,117
Total	25,486,278	34,106,499

But the above table only includes those States producing over 1,000,000 pounds. The addition of the product of those other States which produce less than this amount annually would considerably swell the above total for 1880, and probably bring it up nearly, if not quite, to that of 1860, which was about 40,000,000 pounds, and the largest ever recorded. This, at an average of 10 cents per pound, would give a value of $4,000,000.

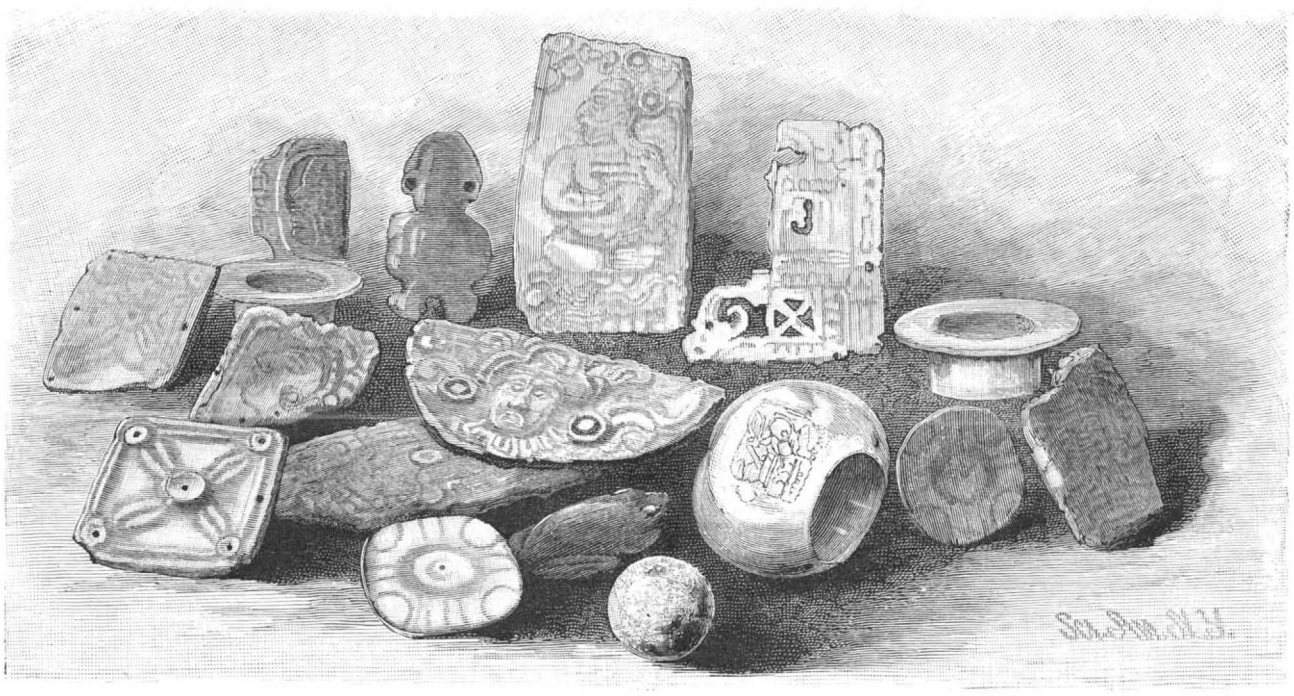
JADE AND JADE OBJECTS FROM CENTRAL AMERICA.

In the American Museum of Natural History, on the gallery floor, there is displayed a group of curiously carved objects. Their colors are various shades of green, changing from a white faintly greenish in hue through a bright apple green to dark jasperoid olive. Their appearance is enigmatic, and their singular and bizarre forms and sculpture lend an agreeable contrast to the beautiful stone of which they are made. These objects, from their mysterious association with an extinct civilization, possess a value quite inestimable.

They are cut from jade, a stone which is of itself precious, delicate in tint, dense and tenacious in texture, and of extremely rare occurrence in nature. It takes a most lustrous polish, can be worked into fragile and exquisite forms, although it is so hard that a file makes but little impression upon it. This stone was formerly seldom found in the collector's cabinet, or at best represented by poor and unpretentious specimens, but the spread of Chinese exchange has brought elegant examples of their workmanship in this mineral to the hands of western connoisseurs.

Jade is pre-eminently a mineral of Asia, and its dissemination in prehistoric relics in Europe and America has formed the ground for elaborate disquisitions on early traffic and exchange between these remote regions, or used as evidence to establish a primitive migration from Asia as a center.

It must be remembered, however, that mineralogists now distinguish two kinds or species of stone, to both of which, in common language, the term jade is applied. One of these, *nephrite*, is essentially a silicate of magnesia with a specific gravity of about 3 and a hardness of 6 to 6·5, while the second is *jadeite*, a silicate of alumina with a gravity of about 3·33 and a hardness of 6·5 to 7.



JADE OBJECTS FROM CENTRAL AMERICA.

Prof. H. Fischer, of Germany, has devoted a great deal of attention to a close study of the probable origin of the jade objects of America and Europe, and reached the conclusion that one class, the nephritic, had been derived from the mines of Turkestan, and that the second class, the jadeites, had been brought from Burmah.

This rather strained conclusion has been combated by Dr. Meyer, of Dresden, who states that bowlders and fragments of nephrite have been found in North Germany and Steiermark, and raw jadeite in large masses, generally as bowlders, in Alaska.

In this opinion, recently published, he has been sustained by Prof. Arzruni, of Breslau, and so far as regards jade implements and objects in this country, it is interesting to learn that the Smithsonian Institution has received reports of the finding of jade in place, along with jade specimens, in Louisiana, while in 1881 Dr. Brantford, their agent, was commissioned to make careful examinations for possible jade mines in Central America.

Many other minerals seem to have been confused with jade, as ancient authors speak of specimens of a citron yellow, deep blue, turquoise blue, and red. Jasper, prase, emerald, and chalcedony have thus been confounded with true jade. In China the jade is called yu, a name of great antiquity, and is brought from the city of Khotan, in the canton of Yarkande, of Turkestan, being transported from Tartary through Bokhara. Here there are said to be mountains composed of this valuable stone, but the finest specimens are only found in the seams of the highest pinnacles, which are detached by the workmen, who clamber to these points and roll the separated masses down the mountain side.

Jade figures extensively in Chinese literature. It has been regarded with admiration from the earliest times. It is the synonym of purity and virtue. It forms the richest and most expensive decorations of the wealthy, and a thousand allusions in poetry and drama indicate its absorbing fascination for the Mongolian mind.

This stone was regarded by the inhabitants of Mexico and Central America with equal delight, and the evidences of their art are shown by our illustration. It was called by the Aztec the *chalchiuitl*, and the familiar story bears repeating of how Montezuma, in sending presents to the King of Spain, "desired to add a few *chalchiuitls* of such enormous value that he could not consent to give them to any one except such a powerful emperor. Each of these," he added, "is worth two loads of gold."

These interesting relics were discovered in 1852, in a vault in Ocosingo, in the department of Quesaltenango, Guatemala, and were purchased by the Museum from E. G. Squier, the famous explorer and archæologist. The most striking piece in the collection is shown in the center of the group. It is the Central American Buddha or Cuculcan, who was adored in Mexico under the name of Quetzalcoatl —the green feathered serpent. Of this quite delicately cut figure in pale jade, blotched with emerald stains, Mr. Squier says:

"The figure is represented seated cross-legged on a kind of ornamented couch or cushion, with the left hand resting on the left thigh, while the right hand is raised breast high, as if in the act of benediction. He wears a girdle around his loins, and on his breast is represented an oblong rectangular plate or tablet, suggestive of that said to have been worn by the Jewish high priests. The face is in profile, showing the salient nose and retreating forehead that characterize most Central American sculptures. An ornament is inserted in the lobe of the exposed ear, and the head is surmounted with the characteristic elaborate plumed head-dress that we observe on the monuments and in their paintings."

Two cup-like objects, with expanded rims, will be noticed in the illustration. These are rings which are supposed to have been attached to the heads of dignitaries or priests, and to have confined sheaves of feathers, such as so commonly constituted their luxurious head-dresses. Another characteristic head is shown upon the irregularly semicircular fragment near the middle of the group. Here is repeated the elaborate coiffure, in the midst of which appears a shield-like accessory; the enormous earrings are shown, and a collar or necklace projects beneath the chin. A close inspection of the carving reveals the tip of the tongue pushed up between the lips, which Mr. Squier considers a symbol of *life*, "for *to speak*, among the aborigines of America, was the synonym of *to be*." A similar though more profusely decorated head, with pendent earrings and massive necklace, is shown, and an instructive profile upon a triangular piece of jade near by presents the same features more clearly, while the high cheek bones, rather oblique eyes, and arched nose are typical.

Another striking relief has been cut upon a cylindrical portion of darker jade, and symbolizes death, with its closed eye and the depending tongue. This was taken from the ruins of Tuloom on the mainland of Yucatan. The other objects are less interesting, but all are carefully perforated, and some at a number of points, justifying the belief that they were suspended and used in personal decoration, or as ceremonial badges.

The skillful execution of these objects, the admirable portraiture, and the evidence they afford of the existence of a specialized class of artisans, as well as of a stock of ideas to illustrate, contribute to elevate our conceptions of a civilization which before the arrival of Columbus possessed its cities, temples, and an organized system of government.

Cure of Elephantiasis by Electricity.

An interesting communication on the treatment and cure of elephantiasis among Arabs by Doctors Moncorvo and Silva Aranjo has been presented to the French Academy of Sciences by M. Gosselin. The cure consists in decomposing the tumid swelling of the limbs, known as elephantiasis, by means of electrolysis, but at the same time the general health of the patient is also treated hydropathically, that is to say, by the cold water cure, sea baths, tincture of iodine, iodide of iron, arsenic, and other tonics. These medicines are intended to renovate the constitution, but are not of themselves sufficient to reduce the tumors. Electropathy, however, applied as soon as possible after the first manifestation, checks and ultimately cures it. The cure is generally perfect, and takes place at the end of a few days in some cases; but if the elephantiasis is of long standing the cure is also a long process, and must be accompanied by proper medicines. The electrolysis is effected both by continuous and interrupted currents sent through the tumid swelling.

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Large Chimneys.

At a recent meeting in this city of the American Society of Civil Engineers, a paper by Hiram F. Mills, C.E., describing the construction of

THE PACIFIC MILLS CHIMNEY,

at Lawrence, Mass., was read by the secretary. This chimney was built by Mr. Mills in 1873, and consists of an outside octagonal shell, 222 feet high above the ground, with a distinct interior core 8 feet 6 inches in diameter inside, extending one foot above the top of the outer shell, and 11 feet below the ground. The chimney is founded 19 feet below the ground, upon coarse sand, the foundation being 35 feet square, inclosed by pine sheet piling. The base is concrete, 1 foot thick, then rubble masonry of large pieces of granite in cement, this stone work being 7 feet high. Upon the stone work is placed the brick chimney, the outer shaft being at the base 20 feet wide, and at the top under the projecting cornice 11 feet 6 inches wide. This brick work is 28 inches in thickness at the base; at 12 feet in height it becomes 24 inches, which continues 18 feet; then 20 inches for 20 feet, then 16 inches for 40 feet, then 12 inches for 60 feet, then 8 inches to the top. The inside core is 2 feet thick to a height of 27 feet, and 1 foot thick for the remaining height. The top of the chimney is of cast iron plates, ¾ inch thick. The horizontal flue entering the chimney is 7 feet 6 inches square. The vertical flue of the chimney is a cylinder 8 feet 6 inches in inside diameter, and 234 feet high, with walls 20 inches thick for 20 feet, 16 inches thick for 17 feet, 12 inches thick for 52 feet, and 8 inches thick for 145 feet. The foundations were laid in mortar of Rosendale cement and sand; the outer shell in mortar of Rosendale cement, lime, and sand; and the flue walls in mortar of lime and sand.

During the winter of 1873, the flue being 90 feet above the ground, boilers having 452 square feet of grate surface were connected with the chimney with satisfactory results. Between June and September, 1874, the chimney was finished. The approximate weight of the chimney is 2,250 long tons, the number of bricks being about 550,000. The chimney is opposite the middle of a line of 28 boilers, and 210 feet distant from them. It was designed to serve for boilers having 700 square feet of grate surface—burning about 13 pounds of anthracite coal per square foot of grate surface per hour.

The chimney was struck by lightning in June, 1880, after which date a lightning rod was put up, which consists of a seamless copper tube $\frac{5}{16}$ inch thick, 1 inch inside diameter, at the top of which are 7 points radiating from a ball 4 inches in diameter, the top of the central point being 8½ feet above the iron cap. The rod is attached to the chimney by brass castings, and is connected at the bottom to a 4 inch iron pipe extending 60 feet to a canal.

A description was then read of the

CHIMNEY OF THE MERRIMACK MANUFACTURING CO.

at Lowell, Mass., built under the direction of J. T. Baker, C.E., in 1882. This chimney is founded on a ledge of sandstone. The foundation, 30 feet in diameter, is built of granite blocks laid as they come from the quarry. At the surface of the ground there is a dressed granite base 2 feet 6 inches in height, laid in clear Portland cement, the remainder of the foundation being in Rosendale cement and sand; upon this base is placed the brick work, consisting of three cylinders, the outside one 28 feet in diameter, 24 inches thick, the middle one 18 feet in diameter, 8 inches thick, the core 12 feet inside diameter and 16 inches thick. The middle cylinder is carried up vertically 75 feet 6 inches; the outside ring has a batter 0·42 of an inch per foot to a height of 100 feet. At the height of 75½ feet the middle ring connects with the exterior ring, making the masonry at that point 36½ inches thick; it is then 20 inches thick for an additional height of 60 feet; 16 inches thick for 70 feet; and 12 inches thick thence to the enlargement for the chimney head. The core is uniformly 12 feet inside diameter to the top, the first 100 feet being 16 inches thick; then 12 inches thick for 60 feet; then 8 inches thick for 90 feet; and then 4 inches thick for 29½ feet to the top.

It is entirely separate from the outside masonry except about the doorways and openings for the flues. The core was laid in mortar of lime and sand; the outside shell in lime, cement, and sand. On one side of the chimney is a ladder of iron extending from the ground to the top, and on the opposite side is a ¾ inch galvanized iron wire rope, both ladder and rope being connected with a copper ring having four spurs, the central point of which extends 8 feet above the top of the chimney. The bottom of both ladder and rope is connected with a 16 inch water pipe. Two wrought iron flues enter the chimney, one 5 feet by 6 feet, the other 5 feet by 11 feet. The chimney is constructed to provide for 15 sets of boilers, only 12 now being in use. Each set has 103¼ square feet of grate surface, and is rated at 300 horse power. The weight of the chimney is 3,392 tons; 1,101,000 bricks were used, 6,875 cubic feet of stone masonry. The cap weighs 18,600 pounds; the cost of the chimney was $18,500.

CHIMNEY OF THE N. Y. STEAM HEATING CO.

A description was then given by Dr. Charles E. Emery, M.Am.Soc.C.E., of the construction of the chimney, built under his direction, of the Greenwich Street boiler house of the New York Steam Heating Company. This chimney was a creature of circumstances, it being necessary to place within a very limited area a very large boiler capacity, viz., 16,000 horse power. This was done by making four stories of boilers; the chimney was therefore necessarily located with reference to these boilers, and the plan of the chimney was determined by the shape of the lot. The beach of the Hudson River was at some time at this locality, and the foundation of the chimney was placed in fine clear beach sand, with some pockets of coarser sand, and a little stone. The foundation is one foot below high water. The chimney is 27 feet 10 inches in the clear inside, and 8 feet 4 inches wide. The height is 220 feet above high water, 221 feet above the foundation; 217 feet above the basement floor; 201 feet above the grates of the lower tier of boilers; and 141 feet above the grates of the upper tier of boilers. The thickness of the walls on the interior of the building runs from five feet to 20 inches, and on the other sides from three feet to 20 inches. The gases for each chimney are taken from 32 boilers of 250 horse power each. About 1,000 tons of coal will be burned daily. It is expected that elevator arrangements will be perfected to receive this amount of coal each night. More trouble is experienced with the ashes than with the coal. Ordinary grate bars have been used. Cleaning is done once every six hours. We have used a new bar that turns on hinges and gives good results. We have not made many experiments with coal dust. We have to use a fuel which has some reserve power, to provide for possible contingencies. We find coal is worth about what is charged for it.

A MEXICAN CHIMNEY.

Mr. F. L. Griswold, M.Am.Soc.C.E., described a chimney erected in Mexico for a cotton factory, about 160 feet high, which had been in use for over twelve years, which was built of apparently sun-dried bricks, and which seemed to be now in excellent condition. This chimney was built by Indians, and seemed to be very symmetrical and well made. The bricks were about 10 x 3 x 7.

OTHER CHIMNEYS.

Mr. H. W. Brinckerhoff, M.Am.Soc.C.E., described a chimney constructed of old rails, which was in successful use in Pennsylvania. It was generally known as a crinoline chimney.

Mr. Wm. E. Worthen, M.Am.Soc.C.E., referred to several chimneys built by him, and expressed a doubt as to the necessity of very great height in chimneys.

Mr. J. M. Knap, M.Am.Soc.C.E., described chimneys constructed in Pittsburg, and which, though of very moderate height, had given excellent results.

Healthy vs. Injurious Brain Work.

There is such a thing as mind strengthening work. In truth, it is, as every physiologist knows, only by work minds or, more correctly speaking, brains can be strengthened in their growth and naturally developed. The exercise of those centers of the nervous system with whose function what we call consciousness and intellect are associated, is as essential to their nutrition as activity is to the healthy growth of any other part of the organism, whether nervous or muscular. Every part of the living body is developed, and enjoys vitality, by the law which makes the appropriation of food dependent upon, and commensurate with, the amount of work it does. It feeds in proportion as it works, as truly as it works in proportion as it feeds. This canon of organic life is the foundation of those estimates which physiologists form when they compute the value of food in measures of weight lifting power. It is, however, necessary to recognize that, although these propositions are true in the abstract, they need the introduction of a new integer or combining power before any sum of results can be worked out.

We know that food is practically just as truly outside the body after it has been eaten, digested, and even taken into the blood current, as it is when it lies on the table. Nutrition is a tissue function, and its performance depends on the appetite and feeding power—which is something different from the organic *need*—of the tissue with which the nutrient fluid is brought into contact. Again, any particular part of the organism may be so exhausted by work that it has not power enough left to feed. It is a matter of the highest practical moment that this fact should be recognized. There is undoubtedly a point at which work ceases to be strengthening and becomes exhausting—self-exhausting and self-destructing so far as the particular issue in activity is concerned.

Work may be carried too far, in fact to such a point that not only the last reserve of power for action, but the ultimate unit, so to say, of the force of nutrition, which is, as we now believe, identical with the force of general activity, may be expended in work and the organism left so utterly powerless that its exhausted tissues can no longer appropriate the food supplied or placed within their normal reach. We have said that it is necessary this should be understood. It has a special bearing on the question of brain work in childhood and adolescence.

Just as extreme weakness and faintness of the body as a whole produce restlessness and loss of control, so extreme exhaustion of the brain produces mental agitation and loss of healthy self-consciousness. This is how and why the "overworked" become deranged. One of the earliest indications, or *symptoms*, of brain exhaustion is commonly irritability; then comes sleeplessness of the sort which seems to consist in inability to cease thinking either of a particular subject or things in general; next, the mental unrestful or uncontrollable thought gets the better of the will, even during the ordinary hours of wakefulness and activity, which is a step further toward the verge of sanity than the mere persistence of thought at the hour of sleep—this way lies madness; and, finally, the thinking faculty, or, as we say, the imagination, gets the better of the will, and asserts supremacy for its phantoms, those of sight or of hearing being the most turbulent and dominant which happen to be most commonly used in intellectual work, and therefore most developed by the individual cerebrum—this *is* madness. Such is the story of overwork of the brain or mind; and it is easy to see that at any stage of the progress from bad to worse the will may be overpowered, and the judgment perverted, in such manner as to impel the victim of this mind trouble to seek refuge in death, or to so disorder his consciousness that he supposes himself to be acting in obedience to some just and worthy behest when he commits an act of self-destruction or does something in the doing of which he accidentally dies. Such, in the main, is the story of suicide from overwork.

What, then, can be the excuse pleadable by those who heap on the brains of the young or adolescent such burdens of mind labor and worry as exhaust their very faculties of self-help and leave them a prey to the vagaries of a starved brain? We pity the suffering of those shipwrecked sailors who after exposure in an open boat, perhaps without food, for hours or days, "go mad" and, raving of feasts and pleasures the antitheses of their actual experience, fall on each other, or throw themselves overboad. Have we no pity for *brains* dying of lack of food because we have compelled them to expend their very last unit of force in work, and now they are distraught in the act of dying?

It may be a sublime ideal, that of a highly educated people; but if it should happen that the realization of this beautiful dream of our philosophic reformers can only be achieved by the slaughter of the weak, it will scarcely console the national conscience to reflect that, after all, "the survival of the fittest" is the law of Nature.—*Lancet.*

Food and Treatment in Fevers.

Modern usage differs materially from the practice some years ago in the treatment of fevers. Dr. George L. Peabody, of the New York Hospital, recently read a paper on the treatment of typhoid fever, before the New York County Medical Association, advocating the full cold water bath, and approving solid food at the beginning of convalescence. Dr. Austin Flint, Jr., in discussing the paper, said: "No physician of the day believes that the production of heat in fevers comes from the oxidation of the blood in its passage through the lungs. It is considered as one of the results of a class of phenomena which occur in the tissues themselves. Physiology has advanced in the direction of positivism, and is rapidly being reduced to mathematical exactness. Experiments have been made to determine the heat value of certain elements of food. I found by observation of a man who walked 317½ miles in five days, and also by experiments upon myself, that more heat units were produced than were supplied by the food. I have also come to the conclusion that water is formed in the body by the union of oxygen and hydrogen. The production of something requires material; heat cannot be produced without the consumption of something. In typhoid fever, in the absence of nourishment, the fever must feed on the tissues. The question is, What will supply this material? It has occurred to me that fatty, farinaceous, and saccharine food, glucose and alcohol will save the tissues. In the experience of physicians, alcohol reduces heat in fevers. Theoretically, one ounce of French brandy is equal to 398 heat units; thirty-four ounces would supply all the heat produced in his body in twenty-four hours, by a man weighing 140 pounds. It seems to me that if you can supply the fever with food for the time it runs—and it must run—you will have the patient in a better condition as to tissue."

Prof. Austin Flint, Sr., said: "I differ as to the value of sponging as a means of reducing temperature. Where it is properly performed it is efficient. I also use and recommend enveloping the body in a wet sheet, which should be sprinkled from time to time until the temperature is reduced. I concur with Dr. Peabody as to the absence of danger in giving solid foods, when the patient desires it. There is no specific at the present time for typhoid fever. In my early practice, no alcohol was given, and the patient was placed on a starvation diet. Then came a time when alcohol was used freely; this was followed by a more moderate use of it."

Running for Trains.

The *Medical and Surgical Reporter* cautions those persons who are in the habit of "running for trains" against the practice.

Even to one whose heart is sound, running, when not accustomed to such hurried movement, is certainly not beneficial to the delicate cords and valves of the heart; and should this organ be diseased, it must prove very injurious.

We all know that violent and tumultuous action is to be avoided when the heart is weak, and we also know that running is not the way to avoid it.

In our own experience, says the writer, we know several instances where men who had previously supposed themselves to be *sound* have run for trains, and getting aboard have fallen exhausted into seats from which they never arose.

Better miss a train than run the risk of running into the jaws of death; for this strain on the heart cannot prove beneficial to one that is sound, while it is likely to prove disastrous to one that is weak.

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ENGINEERING INVENTIONS.

A steam trap has been patented by Messrs. William and Willie D. Puffer, of Janesville, Wis. This invention covers certain novel features in constructing a steam trap to operate with either cold or hot water, and allow the cold air to pass out of the pipe, so the water may enter the trap.

An improvement in railroad signals is the subject of a patent issued to Mr. John Mayne, of Atchison, Kansas. With the outer end of an arm carrying the signal board, a connecting rod is fitted, which passes with the arm into the building, the connections being all positive, and such that the signal can be readily operated from inside the building.

A spark arrester, for use in connection with the smoke stack of a locomotive, has been patented by Mr. John C. Albrecht, of Columbus, Ga. It combines volute and horizontal partitions, with branches, scrolls, and special passages, in connection with the smoke pipe and a cone, to arrest cinders and force them back into the fire, and also increase the draught.

A high pressure alarm for steam boilers has been patented by Messrs. Charles W. Johnston and Patrick Brown, of Philadelphia, Pa. The principle of the device is such that the weight lifting part exposed to the action of the steam is kept in continuous or frequent motion by the varying pressure above a given and set limit, so that danger from sticking, as in the ordinary valve, is avoided.

MECHANICAL INVENTIONS.

An improved lever power mechanism has been patented by Mr. Frederick Kubec, of Riverside, Iowa. This invention provides a special means of reversing the pawls for a pair of toothed wheels geared together in a frame, so as to reverse the motion of the object to be driven quickly and easily at the will of the operator.

A tile laying machine has been patented by Messrs. Jesse T. Graves and Benjamin F. Belt, of Colo, Iowa. It is to facilitate the embedding of drain tiles in the surface of lands, and covers a special construction in which the cutters cut the soil loose at the sides of the trench, so that the two slices formed on two inclines shall slide down against each other and form a cover for the tiles and trench.

AGRICULTURAL INVENTIONS.

An improved cultivator has been patented by Mr. Alvah Schoonover, Jr., of Elliott, Iowa. The invention covers a special construction and arrangement of parts for connecting the plow beams with the axle, so the rear ends of the plow beams can have a free, vertical, and lateral movement, and their forward ends be adjusted inward or outward.

A cornstalk rake has been patented by Mr. George A. Runyan, of Augusta, Kansas. This machine, while adapted for marking from the provision of four transporting wheels, arranged in pairs in a particular manner, has a raking attachment that may be locked or held out of action at will, so that it may also be used as a marker alone.

A seed planter has been patented by Mr. Asahel Smith, of Chatham, Ontario, Canada. The object is to promote accuracy in operation and facilitate the adjustment of the seed dropping mechanism, the seed dropping slide being held against a cam wheel which is seated upon a flanged wheel attached to the drive wheel, so that the slide can be operated with certainty and the cam wheel readily adjusted.

A land marker has been patented by Mr. William H. King, of Little Silver, N. J. The object of this invention is to facilitate the marking of land for planting, and it consists in a special construction and combination of parts, so that when the machine is drawn forward, the plows open channels to receive seed, etc., and a shoe marks the ground parallel with the channels opened by the plows, at such distance from the outer channel as to be midway between the plows at the next passage of the machine across the field.

MISCELLANEOUS INVENTIONS.

An insecticide compound has been patented by Mr. Henry Pool, of Westminster, Md. It consists of slaked lime, plaster of Paris, ammonia, sugar, oil of worm seed, and oil of sassafras, in specified proportions.

A sofa bedstead has been patented by Mr. John Baggs, of Baltimore, Md. This invention relates to that class of lounges to which various devices are attached for convenience in surgical operations, and covers a special construction and combination of parts.

An improved harness hook has been patented by Mr. Samuel B. Edson, of Monterey, Ind. It is a rigid hook or buckle adapted to be used in the place of an ordinary snap hook, the hook having a curved body with a concaved outer surface, with a pin near its end, and loops and guard.

A clamp for ruling pens has been patented by Mr. John W. Dirhold, of St. Louis, Mo. This invention consists in a combination and arrangement of parts to improve ruling machines, in which the pen holders are moved laterally in parallel position by levers connected by pivots to form a lazy tongs.

A convertible bridle and halter has been patented by Mr. John A. Nesbit, of Charlottesville, Ind. With a ring of the bridle is combined a halter attachment with rings and strap, the whole specially designed so that the bridle may be readily converted into a halter, or the halter into a bridle.

A ditching machine has been patented by Mr. Alonzo Purcell, of Monticello, Ill. A special construction of wheel, plow, shovel, shifting board, and mould board chutes—so framed and combined as to make an easily guided machine to cut a furrow or ditch of required depth by successive cuttings.

A ball trap, being an improved device for throwing targets, such as clay pigeons, etc., has been patented by Mr. Charles F. Stock, of Peoria, Ill. There is a novel device at the outer end of the throwing arm for holding the target, it being adapted to retain the target during the swing of the arm, and release it at the proper time.

A fire escape has been patented by Mr. Charles Von der Linden, of Rhinebeck, N. Y. This invention consists principally of a holder containing two pulleys, and a brake plate adapted to act upon the pulleys, so that a person descending from a burning building by means of a rope may readily regulate the speed of his descent.

A broom holder has been patented by Messrs. Alexander Frazier and Daniel J. Coburn, of Maywood, Ill. This is a rubber jaw-like clamp, with box for holding it, for holding brooms by their handles when not in use, without regard to length of the handle or portion inserted in the holder, and which will be automatic and self-adjusting.

A mail bag fastening has been patented by Mr. Roy B. Scott, of Denton, Texas. A chain is fixed to one side of the bag, so as to swing on the lower edge, and having hooks or studs to pass through the eyes of the two sides of the bag and around or through another chain on the other side of the bag, making a simple, firm, and easily manufactured fastening.

A hame fastener has been patented by Mr. Benjamin F. Jones, of Beauregard, Miss. The end parts at the top and bottom are connected with hooks and toggle, so that the hames may be drawn more or less closely together according to the size of the horse's neck, the parts therefor showing special construction and combination.

A fire escape has been patented by Mr. Henry Poole, of New York city. This invention covers a special construction of easily portable fire ladder, which, as it is elevated, also raises a continuous canvas chute, down which persons from the burning building may safely slide, it being designed to have a mattress at the bottom.

A cartridge reloading tool has been patented by Mr. James H. McCabe, of Jacksonville, Fla. The die groove has hardened steel pins to crimp the open ends of the cartridge tubes over the wads; a creasing lever and bit is also provided for this purpose, the tool being readily opened and the tube inserted as far as required.

An automatic rain water regulator for cisterns has been patented by Mr. Frederick E. Lord, of St. Louis, Mo. This invention covers a special construction of valves and pipes to so regulate the flow of water into a cistern or tank that the dirty water coming first in a rain will be carried off, and when the tank is sufficiently full the overplus will be carried away.

An improved cistern has been patented by Mr. James W. Barnum, of New Orleans, La. In house cisterns, such as receive water from the roof, the construction is such as to obviate all danger from the tank overflowing during hard or continuous rains, and during such times accumulated dirt is allowed to pass off from the bottom, the tank being thus self-cleaning.

A liquid cooler has been patented by Mr. Herman Lindenberg, of Jersey City, N. J. The invention consists in a flat sheet-metal vessel adapted to be connected with the spigot of a barrel, and having in its lower part a cock or spigot, such vessel having transverse partitions, which cause the liquid to circulate therein and be cooled by coming in contact with the side of the vessel placed in a box filled with ice.

An improved metallic pen has been patented by Mr. Hezekiah Hewitt, of Birmingham, Eng. The extreme points of the nibs are bent backward to provide a flexible curved writing surface on the under side, and a minute reservoir on the opposite side, there being also connected a main ink reservoir in the concave body, to hold a greater quantity of ink than ordinary pens.

A folding basket has been patented by Mr. Anthony Daul, of Jamaica, N. Y. The opposite edges of the front and back are hinged to the bottom, the ends being hinged to the ends of the front, and the cover is made of two halves hinged to the upper edge of the back; the basket, also, has handles with hooks, which can be fastened to the basket when erected or folded.

A folding egg case has been patented by Messrs. Samuel M. Toay and Edward Harris, of Cambria, Wis. It has hinged end, front, and rear boards, a hinged transverse partition, and a cover formed of two sections hinged to each other, of which one is hinged to the rear board of the case, thus permitting the end boards to be folded inward and the front and rear boards to be folded over them.

A tile ditching machine has been patented by Mr. John Arthur, of Streator, Ill. In combination with a wheeled truck and an elevator thereon is a spade, vertical ways for the spade, means to reciprocate the spade therein, longitudinal ways for the spadeways, etc., the power which runs the spade also running the elevator, and the speed being regulated by the hardness of the earth.

Cards for playing loto and other games form the subject of a patent which has been issued to Mr. Henry H. Harrison, of New York city. The invention consists in a card with a base plate having the numbers printed thereon, an intermediate plate with slots over the rows of numbers, a top plate with openings over the numbers, and slides for covering the numbers.

An improved churn has been patented by Mr. William H. Tawney, of Louisburg, Kansas. The dasher consists of a plate or blade apertured centrally, and preferably square at the bottom, to work small quantities of cream to better advantage, and a simple and effective lever power apparatus is provided for working the dasher, which is also applicable for other light running machinery.

A bale-tie splice has been patented by Mr. Frederick Bommarius, of New Orleans, La. This invention is for utilizing the scraps or short lengths of bands, by making a simple and firm band-splicing tie, having reference to metallic bands such as are used in baling cotton, whereby waste is avoided, and the bands are not likely to loosen by jarring, as occurs when rivets are used.

An improved lumber drying kiln has been patented by Mr. Lafayette Rollins, of Mountain Creek, Ala. The drying kiln or house is preferably of brick, with an extension at one end with furnace and boiler, and pipes extending along the floor beneath the tracks over which the lumber is moved, with certain novel features of construction for the convenient handling of lumber and entire removal of the sap therefrom.

A bottle filling device has been patented by Mr. Philip J. Hogan, of Negaunee, Mich. This invention provides for the accurate measuring of the fluid with which bottles are filled, has a vent with a long flexible pipe, a discharge valve with a tubular side perforated stem, with special means for adjusting the vent pipe and outlet, making a rapidly acting measure as well as a bottle filler.

A fire escape has been patented by Mr. Aaron Walker, of Kokomo, Ind. It relates especially to an improvement connected with a former patent granted to the same patentee, and combines with a windlass one or more ropes, pulleys, and weights, whereby the swinging balcony suspended from a windlass is balanced and remains stationary at any desired point.

A ruffling and shirring attachment for sewing machines has been patented by Mr. William Dudley, of Newark, N. J. It provides a novel and improved device, of simple construction, for overlapping or folding a cloth or fabric, the fabric on the bed plate being carried forward by a straight and reciprocating motion, making a neater fold or plait than when the spring finger rocks or swings.

An improved wagon brake has been patented by Mr. James Hocking, of Denton, Neb. It is of the form in which brake shoes are automatically applied to the wheels by the back thrust of the team, is intended to act while the wagon is turning as well as when straight, is easily applied, and permits the wagon to be lengthened or shortened, while it is light and strong of construction.

A beer cooler has been patented by Mr. Charles L. Krum, of Minneapolis, Minn. A false rail or front is attached to and forms part of the slide, and contains the tap hole for the faucet, with a plate and closer therefor, permitting the door to be opened on its hinges, and to the plate is a narrow sheet of rubber or other flexible material, with a hole to close around the faucet when the keg has been shoved back into the cooler.

A velocipede has been patented by Mr. George L. O. Davidson, of Manchester, Eng. There are such improvements in the mounting of the frame and wheels, and with relation to the rear driver's seat and front passenger's seat, as to cause the weight of the mounted driver to overbalance the weight of the passenger, and to hold the steering wheel to the ground, except when the driver dismounts to push the machine by hand.

A harmonic coupler for piano actions has been patented by Mr. William S. Wright, of Dover, N. J. In combination with key levers are coupling levers, with their front ends over other levers, with slitted, beveled sliding blocks for coupling the front ends of the coupling levers to the key levers above which they rest, with device for adjusting all the coupling blocks to couple simultaneously, so harmonic sounds can be produced by depressing one key.

A fire escape has been patented by Mr. William Wise, of Medway, Ohio. A tubular mast with telescoping sections has a rope attached to the inner section, pulleys on the other sections over which the rope runs, means for raising the mast and a sheet metal fire escape car closed at the top and bottom, so that several windows may be supplied with means of escape for the occupants by swaying the mast from side to side.

A lightning arrester, for electric lines, has been patented by Mr. Charles W. McDaniel, of Carthage, Mo. Its object is to prevent the coils of telephone instruments from being burned and destroyed by strokes of lightning, and it provides for an insulating strip on an insulating base, with as many metal plates as there are clamps on the base, the strip passing into the clamps, and the intermediate plate or plates connected with the ground wire.

An improved air pump has been patented by Mr. Miguel Boom, of Port-au-Prince, Hayti. It is intended for compressing air as well as making a vacuum, by turning a cock plug in a tube uniting the inlet and outlet tubes at the end of the cylinder, the plug having channels for establishing communication between the outer air and the inlet or outlet pipes of the cylinder, and between the pipes, and a tube united with the vessel for receiving compressed air, or in which a vacuum is to be produced.

An improved filter has been patented by Mr. Edwin L. Barber, of Chicago, Ill. The invention covers a cylindrical water vessel with slanting partition from the bottom to one side below the top, a vent tube in the partition extending to the top of the vessel, holes in the bottom of each compartment, one or more chambers to hold filtering material connecting said holes, and a faucet entering the inclosed compartment near its bottom, all to make a filter to purify water for drinking.

NEW BOOKS AND PUBLICATIONS.

DIE MOTOREN DER ELEKTRISCHEN MACHINEN MIT BEZUG AUF THEORIE, CONSTRUCTION UND BETRIEB. By Th. Schwartze. A. Hartleben, Vienna.

This book constitutes vol. xxi. of the Elektro-technische Bibliothek, and might primarily be called a treatise on prime movers, their theory, construction, and working. These include windmills and the various hydraulic, steam, hot air, and gas engines. In connection with the chapters on the steam engine are several on steam boilers and illustrating several smoke preventing devices. In addition there are chapters on the theory of governors and dynamometers. Altogether, the volume is interesting, and will, no doubt, prove valuable, especially to students, giving as it does a concise review of nearly all prime movers, and their application to the driving of electric machinery.

SILVER-LEAD DEPOSITS OF THE EUREKA DISTRICT, NEVADA. Abstract of Report of the United States Geological Survey. By Joseph Story Curtis.

The ore deposits of this region have been of great interest, not only for their exceeding productiveness, but from the obscure character of their structural relations, and they have been the cause of a good deal of litigation, in the course of which geologists and mining engineers have presented very different views. It was partly on these grounds that Mr. Curtis was deputed by the Director of the United States Geological Survey to undertake a special study of the Eureka mines, and this monograph is the result. The information given is important locally, as justifying mining to still greater depth in the sections examined, but is of much wider interest among geologists and miners from the peculiarities of the occurrence of irregular bodies or argentiferous lead ores in limestone. The report is accompanied by an elaborate and beautifully executed geological map of the district, with sectional views through different mines.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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One can't disassociate the highest taste and comfort from a gentleman in slippers and gown, on piazza chair or sitting room lounge, with a pipe filled with Blackwell's Durham Long Cut in his mouth. In appreciation of this Oriental pose and *dolce far niente* air, his tobacco is served in an artistic package of embossed and pictured foil, at once a delight to the eye and a study for the mind.

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Stephens Bench Vises are the best in use. See ad., p. 173.

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R. A. Belden & Co., Danbury, Ct.

"The Sweetland Chuck." See ad. p. 188.

Hoisting Engines for Mines, Quarries, Bridge Builders, Railroad Construction, etc. Send for catalogue.
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For Freight and Passenger Elevators send to L. S. Graves & Son, Rochester, N. Y.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

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Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Improved Skinner Portable Engines. Erie, Pa.

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Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 174.

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For Mill Mach'y & Mill Furnishing, see illus. adv. p.172.

Steam Pumps. See adv. Smith, Vaile & Co., p. 174.

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

Ajax Metal Company, Phila. Clamer's Ajax Metals for railroad, rolling mill, engine bearings, cocks, and valves.

Job lots in Rubber Belting, Packing, Tubing, and Hose. 75 per cent off belting. John W. Buckley, 156 South Street, New York.

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Gould & Eberhardt's Machinists' Tools. See adv., p. 206.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 206.

Drop Hammers, Power Shears, Punching Presses, Die Sinkers. The Pratt & Whitney Co., Hartford, Conn.

Catechism of the Locomotive, 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N. Y.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The Porter-Allen High Speed Steam Engine. Southwark Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Gears.—Grant, 4 Alden St., Boston.—Water motors.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) F. A. P. asks: How long will galvanized cast iron stand exposed to the weather (such as an iron fence) without signs of rust? A. If the iron is perfectly galvanized, it will last for a long time. If the union of the zinc and iron is imperfect, rust will appear very soon.

(2) C. M. W. asks: 1. When two spur wheels rolling in contact are partly worn out, are the teeth the proper shape for a uniform transmission of motion? A. If the metal of which the wheels are composed is homogeneous, the wheels will wear so as to transmit uniform motion. 2. Will the teeth of two pairs of spur wheels of same diameter, same pitch, and conveying same power wear to the same shape, when one pair had involute and the other epicycloidal teeth when new? A. Yes.

(3) C. J. H. writes: In the process of amalgamation of gold bearing ores, it is desirable to reduce the ore to a very fine state of subdivision by abrasion or trituration, after having been roasted and crushed with Cornish rolls. Buhr millstones are sometimes used for grinding the ore. I have suggested that cast iron disks faced with heavy plates of soft copper be used instead of buhr stones. In your opinion, would copper faces be as efficient for the purpose as buhr stones? What would be the probable result in using the copper faces? I wish to reduce the ore to the finest state attained by mechanical process, wet or dry. A. It is possible that some of the harder particles of the ores might embed themselves in the copper and act something after the manner of diamond dust on a lap, but we fear the results would not be very encouraging. You could test the matter experimentally.

(4) L. C. M. writes: I wish to ebonize some maple by boiling it in a dye, so as to have it penetrate into the wood. I can dye the pieces, but cannot season them after taking them out of the dye without nearly all of them becoming checked. The wood is kiln dried before it is put into the dye, and stays in the dye about twenty-four hours. Does immersing wood in a solution of caustic soda have any tendency to toughen it? A. Your difficulty is probably due to some lack of proper manipulation, which could only be detected by seeing you work. The following, if properly conducted, might give satisfactory results: Into a quart of boiling water put 1½ ounces of copperas and 2 ounces of logwood chips. Lay on hot; when dry, wet the surface again with a solution of two ounces of steel filings dissolved in half a pint of vinegar. When dry, sandpaper down the grain and get a smooth face, and as the work to be ebonized must be quite free from holes, oil, and fill in any of these with powdered drop black mixed in a filler. Then give a coat of quick drying varnish (made by dissolving black wax in spirits of wine), and finish the work by rubbing down with finely pulverized pumice stone and linseed oil until a good surface is acquired. We fail to understand how any advantage can be gained by using caustic soda.

(5) W. S. N. asks: 1. Can you give me a receipt for the preparation of washing blue in powder, similar to what is now put on the market in boxes with perforated tops? A. We give herewith 4 receipts for the manufacture of liquid bluings, any of which will answer: (*A.*) Dissolve indigo sulphate in cold water and filter. (*B.*) Dissolve good cotton blue (aniline blue 6 B.) in cold water. (*C.*) Dissolve Prussian blue in cold water, adding one-eighth part oxalic acid in water. (*D.*) Dissolve Tiemann's soluble blue in water with 2 per cent of oxalic acid. See also SCIENTIFIC AMERICAN, page 261, for April 28, 1883, for formula of disinfecting wash blue. 2. Can you give me a receipt for a washing compound, such as is put on the market as pearline, etc.? A. Pearline is simply a trade name given by James Pyle to a soap manufactured by him, and it would be impossible to say anything about its composition, unless it were definitely analyzed and its exact ingredients ascertained. Morfit's work on soaps will give you numerous receipts to select from.

(6) A. T. D.—You could not compress gas in a balloon. It would not help the lifting power if you could. You can make hydrogen gas in barrels, by charging with zinc, 25 or 30 pounds to a barrel. Then half fill the barrel with a mixture, 10 parts of water to 1 part sulphuric acid. Attach a rubber tube to the bung, with its other end attached to another barrel partly filled with water to catch any acid vapors that may come over. A half dozen barrels, attached to one receiver, and the receiver connected with the balloon with a larger tube, will answer your purpose. A description of how hydrogen gas is made is to be found in SUPPLEMENT 241.

(7) F. W. G. asks: 1. What appliance is used in drawing room coaches and cars to store carbon gas for illuminating purposes? A. The Pintsch (German) system is used in Europe on railroads; in this country on the Erie and the New York, Providence, and Boston railroads. 2. If it is compressed in a cylinder, and how much will cylinder hold? A. Illuminating gas for portable purposes is not compressed in this country; it is flowed into India rubber bags from street gas mains at the ordinary pressure, and its outflow is governed by weights pressing on the flexible bag. 3. Is it patented, and who is the patentee? A. We do not know that it is patented.

(8) A. M. F.—We know of no cheap process of reproducing maps and drawings in black lines. The ordinary photographic method is as good as any. Twenty to twenty-five cells of Bunsen battery will light a room with a small arc light. For an incandescent light more battery power would be required. We cannot advise the plan of lighting by means of batteries. Write dealers in electrical supplies who advertise in our columns.

(9) C. H. P. asks the safe velocity for fly wheels of different sizes and weights, and the rule for calculating it? A. Cast iron fly wheels well proportioned and fitted, and of good material, may be run safely with speed of 60 ft. per second, and frequently have been run at a greater velocity for special purposes. You will find rules for fly wheels in "Bourne on the Steam Engine," "Bourne's Catechism of the Steam Engine," "Marks on Proportions of Steam Engines," and "Regg on the Steam Engine."

(10) H. G.—There is nothing so cheap or convenient for a freezing mixture as pulverized ice and salt. In chemical laboratories other materials are used for experimental refrigeration. They are too expensive for general use. The following are some of these combinations:

Sal ammoniac	5 parts.
Niter	5 parts.
Water	10 parts.
Nitrate of ammonia.	
Water	equal parts.
Sulphate of soda	5 parts.
Diluted sulphuric acid	4 parts.

See also SCIENTIFIC AMERICAN SUPPLEMENT, No. 89, for methods of freezing mixtures.

(11) S. B. asks: If in a dynamo machine constructed like the one in SUPPLEMENT No. 161, but with field magnets 6 inches wide (and consequently an armature 6 inches long), it would do to wind the armature with No. 30 wire to a resistance of 35 ohms for a current of the highest possible tension? If not, please give the best size of wire and the best resistance for the armature of a high tension machine like the above. A. You can get a high tension current in the manner proposed.

(12) F. A. R. asks: What is the best kind and size of battery, and how many cells will it take to operate a telegraph line half a mile long? A. Use four cells of gravity battery.

(13) J. G. H. asks: What is the best and most durable preparation to paint smoke stacks and other surfaces subjected to heat? A. Coal tar makes a good paint for smoke stacks. If it is thin enough to add a little finely ground plumbago, it will keep its color better for it. A paint made with boiled oil, lamp black, and plumbago is also good, and will keep its color fairly on heated iron work.

(14) J. E., Jr., asks: 1. What is the best means to secure uniform power from a wind wheel? A. The use of a governor to change the sails according to velocity of wind. 2. How can I estimate the power of a wind wheel with sails square to the wind? The *average* power can only be determined by experience, so as to obtain the average velocity of wind at any given location. 3 To what density is it practical to compress air in cylinders to be used as steam? A. It has been carried to 1,000 pounds per square inch.

(15) W. H. B. asks: 1. How much greater area of cross section should an iron lightning rod have than a copper one, to give the same conducting power? A. The sectional area of the iron rod should be six times as great as that of copper to secure the same conductivity. . With roof surface of 1,000 square feet, copper rod one-half inch square, and a wet clay soil, how far ought I to continue the rod underground, through a bed of charcoal 1 foot deep and 1 foot wide, to give a proper ground connection? A. Carry the rod down till you strike soil that is permanently damp.

(16) F. M. S. writes: I am told that when one is some fifty feet or more down in a well, if he will look up toward the heavens he can see the stars. Will you please be so kind, at your convenience, to explain to me through your able paper the philosophy thereof? A. In the darkness of deep wells and mine shafts the eye becomes very sensitive, and thus is enabled to see the larger class of stars. It is the glare of daylight that blinds the eye to delicate sight. One or two of the largest stars have been seen in open daylight under favorable conditions of the atmosphere. The planet Venus is sometimes seen in broad daylight. Stars can be seen with telescopes in a clear atmosphere during the day.

(17) W. T. B. asks: How can the exhaust from a small steam engine be utilized for heating purposes? A. The exhaust of your engine can be entirely condensed and all its heat utilized by conveying the steam through iron pipes around your room or rooms, in the same manner that you would do for heating with live steam, only with this modification: keep the area of all the pipes combined and all the feed branches fully equal to, if not larger than the area of the main exhaust. Put a back pressure valve in the main exhaust to turn the steam into the heating pipes, arrange all the coils so that the water of condensation will run naturally with the steam to the drips and the vent pipe at the further end of the circulation from the engine, from which point a generous vent pipe should be carried outside or to the roof.

(18) S. A. H. asks: If a tree were to fall on an uninhabited island, would there be any sound? A. Sound is vibration, transmitted to our senses through the mechanism of the ear, and recognized as sound only at our nerve centers. The falling of the tree or any other disturbance will produce vibration of the air. If there be no ears to hear, there will be no sound. The effect of the transmission of the vibrations upon surrounding objects will be the same, with or without the presence of sentient conditions for recognizing them. Hence there will be vibration, but no sound to the things that cannot hear.

(19) J. M. A. asks: Could I use the lenses of a quarter size camera tube to make a magic lantern? Would the object glasses of a field glass be of use as condensers to intensify the light from an oil lamp? A. The lenses of a camera are suitable for a magic lantern. Your object glass is not suitable for a condenser. It has too long a focus for its diameter. The condenser should be composed of two plano convex lenses, convex sides together, 4 inch diameter, 6 inch focus, for a quarter size camera. See SCIENTIFIC AMERICAN SUPPLEMENT 173, "How to make Lantern Slides;" also 236, "Lenses;" 87, "Magic Lanterns."

(20) A. C. McK. writes: I have a machine that I would like to run at a high rate of speed. The balance wheel is 10 in. in diameter, 5 spokes, 1 in. by ½ in. thick, rim 1 in., rounded and securely fastened by a set screw let into the shaft. Please let me know in your answers to correspondents the greatest rate of speed I can attain with safety. The machine does better work the faster it is run, and runs better with a balance wheel than without one, but I don't want to take chances. I have heard of wheels bursting when run at a high rate of speed, so would like to know what rate such a wheel would safely stand. A. If your wheel is of cast iron, we would not recommend greater than 1,450 to 1,500 revolutions per minute; if cast steel, the speed might be increased to 1,750 or 1,800 revolutions per minute. In any event, have a good, strong case fastened over the wheel to limit damage, as all cast metals are very treacherous.

(21) G. W. W. writes: I have a portable engine with a driving pulley 24 in. diameter, making 200 revolutions per minute, and cannot keep steam. If I take off the 24 in. pulley and substitute a 48 in. pulley, and make 100 revolutions, what will be the result? How much more steam will it require, and give rule or method of calculating the same? A. To do the same amount of work with the 48 in. pulley and 100 revolutions that you are doing with the 24 in. pulley and 200 revolutions, you will require double the pressure in the boiler. If you are now carrying the limit of pressure in the boiler, this change cannot be made. You will gain power by increased pressure and slower speed with proper expansion. You may make the pulley 36 in. with a speed of 133 revolutions, which will require 50 per cent more pressure, to great advantage. You may find that the slide valve is not properly set for expansion, or that the piston is leaking steam. This should be examined by some good engineer. The next is good water for the boiler, and clean flues. In the absence of essential data we cannot give further advice.

(22) F. W. C.—We believe the fastest printing presses can make 32,000 impressions per hour, using two impression cylinders, and giving one impression on each side of the sheet. Think there is no press that will do 60,000 in this way.

(23) S. B. asks: What is the real name of the white, spongy part of the bread? A. The crumb.

(24) J. C. Z. asks if an inch piece of bar iron, say 10 feet long, will bend under less pressure than an inch gas pipe, outside measure, of the same length? A. Iron pipe is *much* stiffer for a given weight than solid iron. For a given outside diameter the iron bar will bear the most weight. We cannot tell how much, as there is a great difference in the condition of hardness in both iron and pipe.

(25) J. M. M. says: Please give me the cause of a "poll parrot," of the gray African species, 12 years of age, who lived her life *alone* in a cage, laying two eggs? A. To which another correspondent, J. W. C., replies as follows: The "African gray parrot 12 years of age, who has lived her life *alone* in a cage," has made her mark by "laying *two* eggs." This is the first instance coming to our notice where a bird of this species *gave an ovation* under such peculiar circumstances. The common fowl, *Hennipenna domestica*, has a habit, we are told, of occasionally doing things in this way. But no amount of incubation will bring forth chickens from the eggs she lays. The parrot in question has not only been extraordinary in specific performance, but in the act has *revealed a secret regarding* her sex, which birds of her kind and feather generally keep to themselves. All African gray parrots are wonderfully similar in appearance, and do not seem to age after the *fourth year*, and as to their being *male* or *female*, "no fellow," this side of Africa, "has ever been able to tell" until this one *let out* the facts. Our querist being a dentist, seeks naturally for the *cause* of this ovarian outbreak. We may sound the depths of being, and not find it; but this case suggests *mental impression* as a primal motor. Disturbance, commotion, eruption, are links in the chain of evolution as apparent in the progress of an egg as of a tooth. This Mattoon bird is a treasure, and by way of enhancing her value we observe that she has an obvious talent for *ciphering*, as shown by her *putting down two* and *carrying*—how many? Pretty, pretty polly! Let her beat the hens at *hatching*, if she can.

(26) C. R. asks how to make chloride of gold? A. Gold is dissolved in nitro-hydrochloric acid, and evaporated until all the nitric acid is driven off, and the result is gold chloride. It is best, however, to evaporate the solution to crystallization, and then dissolve the mass in water.

(27) G. L. T. writes: In a late number of your valued journal, SCIENTIFIC AMERICAN, date Jan. 26, 1884, I noticed under head of Notes and Queries (No. 17), W. J. wishes directions for making nickel electrotypes; for his benefit I will state that it is only necessary to proceed in the same manner as for copper, using of course a nickel bath. Nickel is much less injured by friction and pressure, and type faced with it can be used for any color, whereas copper faced type is corroded by some bright colored inks; another advantage of nickel is its hardness, which is almost that of steel, and will therefore last ten times as long as copper faced type. Another circumstance worthy of consideration is this: Copper deposited by electricity from solution has a matte, dull surface, which inclines to crystallization; if a thin coat is used, it is rough and uneven. Nickel, on the contrary, is deposited in an even layer, with a smooth surface, and in consequence it reproduces the lines, in fact the very finest, with a uniformity that never fails. The nickel plating may be as thin as required, and its surface is always equally smooth. A galvanic battery with one liquid may be new to some of your readers; it is composed of zinc and carbon placed in a mixture of 40 parts water, 4·5 bichromate potash, 9 parts conc. sulph. acid, 4 parts sulph. soda, and 4 parts of the double sulphate of potassa and iron. This produces a very regular current, the zinc needs no amalgamation, and no sulph. hyd. gas is evolved.

(28) C. W. asks: What filler should I use for pine wood, which is stained before varnishing; also a good filler for hard woods, as ash? Can it be bought prepared, if so, what should be asked for? What is the process to give cherry the beautiful red finish? Is it in the varnishing, if so, what varnish should be used? A. For filling use whiting, 6 oz.; Japan, ½ pint; boiled linseed oil, ¾ pint; turpentine, ½ pint; corn starch, 1 oz. Mix well together, and apply to the wood. On walnut wood add a little burnt umber, on cherry a little Venetian red, to the above mixture. In the SCIENTIFIC AMERICAN for May, 28, 1881, is an excellent receipt for a filler for hard woods. They can be bought of paint houses in the city. The price varies from 10 cents to 12 cents. The red finish of the cherry is brought about by the use of dragon's blood, which is applied in the varnish or a a stainer.

(29) H. S.—Creosoting, or treating the wood with creosote, is considered the most satisfactory means of counteracting the influence of the teredo in timbers located in the water.

(30) A. G. asks how the gold lettering is put upon the back of books, etc., and what is put on to cause the gold leaf to adhere? A. The letters or design are coated with size or white of egg and stamped into the cloth or leather; gold leaf is then applied to the book, and it adheres where the size is, and the surplus gold is rubbed off with a rag. 2. How the gold printing is done upon cards and paper? A. Gold printing is similar; the design is composed with type, and a size is used instead of ink on the printing press. Bronze or gold powder is dusted over the printing before the size is dry, generally with a piece of cotton, and adheres where the size has been printed on the paper.

(31) T. J. H.—There is no metal of greater power of dilatation by heat under a temperature of 400° than zinc, under moderate pressure.

(32) P. M. S.—Patents cannot be antedated.

(33) D. McR.—Your drain system needs ventilating. The *blind well*, if air tight, does not make room for the water that is suddenly plunged into the pipes. This makes a pressure which breaks the seal of the weakest trap. Make an air vent at the well, if there is no trap between the sink and the well. If there is a trap in the main, then a vent pipe leading from the top of the main vertical pipe to the roof will be requisite to prevent the blowing of the trap seals.

(34) A. T. asks if German silver is injurious to use for a smoking pipe or cigar holder, if so, what other metal would answer for same? A. German silver is not necessarily poisonous or injurious, but we should prefer to recommend some non-metallic substance, such as celluloid or artificial ivory. A silver plated piece could be used.

(35) J. S. asks for a receipt for a lacquer that will put a gold color on copper plated work? A. A pale gold lacquer can be made as follows: 1 gallon methylic alcohol, 10 oz. of bruised seed lac, and one half oz. of red saunders; dissolve and strain. A deep gold lacquer can be prepared of 3 oz., seed lac turmeric 1 oz., dragon's blood one-quarter oz.; alcohol, 1 pint. Digest for a week, frequently shaking, decant, and filter. By using a diluted solution of the latter or by increasing the color of the former, the exact shade wished for can be obtained.

(36) H. C. A. asks how to condense metallic sodium after having put the different ingredients in the retort and heated, or in other words how to collect the sodium? A. The metal will become condensed to a liquid in running along the tube of the retort. It is collected in rock oil or naphtha. A description of the process is given in Lippincott's "Cyclopedia of Chemistry," page 848, vol. ii.

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(37) J. R. J. asks: What do you base your calculation on for the pressure on the surface of an ordinary slide valve? Do you take the whole surface of the valve or only the area of the exhaust port in combination with such part of steam port that may be covered, etc.? A. We take the whole area of the exhaust cavity of the valve and one steam port while closed. The moment that the steam port is opened the pressure is neutralized for its area. 2. What size siphon will it require to discharge 15,000 gallons water in 30 minutes, with a lift of 8 feet? How much water will a siphon with 5 in. suction and 4 in. discharge, with 2 in. steam pipe and nozzle reduced to 1 in. or ⅞ in. with 10 ft. lift, discharge in one hour, steam pressure 60 pounds? A. The best form of siphon ejector upon the market, of the largest size, with a 2 in. steam pipe and 3 in. discharge pipe, lifting 8 ft. with 60 pounds steam pressure, has a capacity of 8,000 gallons per hour. This is nearly the capacity that can be obtained from a 2 in. steam pipe with larger water pipes. We cannot recommend a larger size in one jet. For a discharge of 15,000 gallons per hour you will require four such jets as above described. We know of no trials with larger pipes.

(38) J. S. B., of Virginia, writes: The text books on physics state that the barometer at the level of the sea stands at 30 in. My aneroid barometer yesterday at this place stood at 31 in. As I suppose 30 in. at the sea level means when the atmosphere is free from moisture, please explain under "Notes and Queries" how the barometer can be at any place higher than 30 in. Please give also height of Washington City above sea level. Also state whether there is any method of telling the height of a place above sea level by barometer, except by observations on some day and some state of weather at the sea level, and at the place whose height is desired? A. The *mean* height of the barometer at the sea level is about 30 in. If your barometer was correctly adjusted, it indicated a high wave of pressure in the atmosphere. The annual mean pressure at Washington for 1879 and 1880 reduced to the sea level was 30·107 in. The same for nine years, 30·058 in. Add for your height above the sea 0·001 of an inch for each foot in height, to the *mean* of your station observations corrected for temperature and instrumental errors.

(39) W. B. H. asks: Will you kindly inform me what resistance a spiral spring 1 in. in diameter and 6 in. in length may be made to bear? A. There is no measure for the strength of small spiral springs. Their strength depends entirely upon the size and shape of the wire, and the material of which it is made. A square steel wire or bar makes the strongest spring. A 1 in. diameter with three-sixteenths square steel of the best quality, well tempered, might be relied upon for 100 pounds.

(40) P. L. H. writes: 1. Will you give your reasons for your answer to second part of question No. 14 in your issue of Feb. 2, 1884? A. The answer to the second part alluded to is correct for the same reason that the answer to the first part is correct, both coming under the same conditions. The strain upon all cylindrical vessels, whether tanks for holding water, air, gas, or steam under pressure, is inversely as the diameter. In the case of the water tank, the strain is greatest at the bottom and *nil* at the top. The practice among engineers is to make the courses of plates thicker toward the bottom. This is notably so in the great standpipes of water works. The great mistake among people not familiar with engineering is their failure to understand the *cumulative* strain of *unsustained* walls, due to increased diameter. They seem to compare the conditions of *thin* walls in the distribution of the direction of the thrust directly with walls of masonry, where gravity derived from the weight of material becomes the retarding power. 2. Suppose a wrought iron lap welded pipe 6 in. in diameter and ⅜ in. in thickness be used as a water main with a maximum pressure of 110 pounds to square inch, the same to be buried in the earth at a depth of about 30 inches, what length of time will such a pipe last under the conditions stated? A. Wrought iron pipe is largely used for water, and will last many years. The only difficulty is the gradual decrease in efficiency of discharge by the accumulation of rust nodules upon the inside, which sometimes entirely fill the smaller pipes. Cast iron pipe is the best for water underground. An experience of 40 years has failed to find cast iron water pipes rusted out.

(41) J. C. R.—Aluminum has been used in alloys of copper and zinc and silver, and possibly some other metals. It has been sold as aluminum bronze, and used for jewelry, mathematical and optical instruments, screws, and all. It would probably be a novelty as wood screws, and possibly patentable. You might try it. It costs in Europe about 50 cents per ounce. In this country, about 75 cents to $1.00 per ounce. It is not as ductile as yellow brass—more like gun metal in the form of alumina bronze. If a small portion was mixed with yellow brass, it would not materially affect its ductility.

(42) N. H. asks why will an injector refuse to inject water into a boiler above the line of water level? A. Injectors will feed above the water line. There is no reason for their failure if in perfect order. The only difficulty arises from leaky valves allowing the steam to set back and heat the injector, when it will refuse to start until cooled. There is much difference claimed by the makers of injectors for the power of their various makes. It is possible that some of the 15 kinds now upon the market may fail to feed above the water line from some inherent defect in their construction.

(43) E. H. R. asks: What are the proper chemicals to put into the jars of a battery to run an electro machine or motor to drive a sewing machine? The machine is made for that purpose. The battery is a piece of zinc between two pieces of carbon. The machine has been tried with some kind of acid, but failed to work satisfactorily. The battery is composed of six jars. A. Make a saturated solution of bichromate of potash in hot water. Allow it to cool. Some of the bichromate will crystallize out. Add slowly to the bichromate solution one-sixth its volume of sulphuric acid. This will render the solution hot, and redissolve the bichromate. Add about half an ounce of bisulphate of mercury to every five pounds of solution.

(44) A. L. S. asks for the best method for silvering and oxidizing metals, especially electroplates? A. For information on electro-metallurgy see SUPPLEMENT 310. To "oxidize" silver dip it in a weak solution of sulphate of potash.

(45) A. S. Co. ask whether the moisture could not all be taken out of a damp room heated at the bottom 150°, by ceiling the room with galvanized iron and having a steady stream of cold water flowing over the iron ceiling, and a system of troughs underneath to catch the drip? Would not such an arrangement create a circulation, and convey all the moisture out of a room quickly and thoroughly? A. Heating the air to 150° will largely increase its capacity to hold water; air at 75° that is moist becomes dry at 150°. Your ceiling will require to be much colder than the air before heating it, in order to condense any moisture. A cold room may be made moderately dry by condensing the moisture upon a colder surface and dripping the water into gutters leading out of the room with a siphon.

(46) C. M. H. writes: It is stated that an incombustible paper has been invented by Mr. G. Meyers, of Paris, and that its resistance to heat is so great that fire will not alter its appearance? A. Fireproof paper for writing and other purposes has been made in France by mixing asbestos and wood fiber with a small portion of borax and size, that is said to resist a white heat. The German method is to treat the asbestos with permanganate of potash and then with sulphuric acid before mixing with wood pulp, borax, and glue size. Asbestos and borax are the foundation of all fireproof papers.

(47) S. W. L. asks: What is meerschaum composed of, and where is it found? A. Meerschaum is a silicate of magnesia, and is found in Natoli, Asia Minor. The mines are owned by the Turkish government.

(48) G. L. A.—Petroleum is a preservative for wood. If you can keep it in your fence posts after they are saturated with it, they will be durable.

(49) W. H. T. writes: I wish to make "idler" pulleys 1½ in. diameter with groove for ⅛ in. round belt to run at 6,000 revolutions per minute. The speed to be kept up from a half minute to five minutes at a time, and pulleys to run noiseless. Of what metal or alloy shall I make them to run with the least amount of oil, and to wear the longest? A. Never run idler pulleys loose on a shaft. Make them of iron or steel fixed on a shaft, and run the shafts in metalline boxes; they will run noiselessly and without oil, or at least with the minimum amount that will moisten the journals.

(50) G. E. E.—It is impossible to form any opinion in regard to the possible amount of silver that a mineral may contain without first assaying it. The larger of the two specimens may contain silver, but the smaller one is simply a piece of iron ore. Cost of assay for silver, $5.00.

(51) F. H. B. asks the best way to case-harden gas pipe, the diameter of pipe 6 in., and 4 in., corrugated on the outside with 18 or 20 corrugations per inch, about three thirty-seconds of an inch deep. I wish to know the most thorough manner regardless of cost. A. All casehardening is superficial, as its name implies. The best method of case hardening is packing the article to be treated in a tight box of iron with ground bone, prussiate of potash, and charcoal, and heat for several hours to a red heat. Then plunge into water. The longer the exposure to the heat, the deeper the coating.

(52) G. C. S. asks: What amount of air can be ejected in one revolution of the piston, say the cylinder is 12 in. in diameter and the stroke 18 in? Also, which possesses the greatest power—steam or atmospheric pressure? A. Your cylinder 12 in. diameter, 18 in. stroke, will discharge 1·177 cubic feet for each stroke of its piston, or twice this amount for a revolution of the driving shaft, *without* compression. If you wish to compress air, say to 15 pounds pressure per square inch, then but one-half of the above amount can be discharged without clearance at the ends of the stroke. For equal conditions there is no difference in the power of steam or air.

(53) A. M. B. writes: All old water-mill men insist that a saw runs faster and stronger, and will cut more lumber, at night than in the daytime. Is there any reason for this that can be accounted for scientifically? A. We never could appreciate that water was any heavier, or that machinery runs any lighter, at night than by day. We think that the difference would perhaps be due to the change in the temperature, whereby there will be less friction of the parts.

(54) W. G. F. asks: 1. In making rubber stamps is the rubber melted or dissolved? A. It is softened by heat and pressed into the moulds, and afterward vulcanized. 2. What kind of rubber is used? A. The rubber is mixed with sulphur. It is sold already prepared. 3. How may sticking to the mould be prevented? A. By dusting powdered soapstone thereon. Plaster moulds are generally used, and destroyed after use.

(55) F. A. asks: How much weight can a magnet needle of a ship's compass carry without refusing to do its duty? A. Any weight added to the needle tends to increase friction on its pivot and to make its action heavy.

(56) R. T. M. writes: We have a dispute about a coal burning boiler having no furnace. Is not the plate that separates the steam from the fire the line that distinguishes the furnace from the boiler? A. A locomotive or marine boiler or any internally fired boiler is said to have a furnace, because the fire box forms part of the boiler construction. A cylindrical or brick set boiler comes under the opposite signification. 2. Is machine riveting as strong as hand? Don't hand riveting crystallize the iron? A. Machine riveting if carefully done, so that the rivets are set square and fair, is fully as strong as hand riveting. Crystallization takes place afterward, and is a slow process. We have seen it in old rivets, not often in new.

(57) F. H. C.—The Fuller battery will not readily freeze, and is well adapted to ringing door bells. It will work a long time without attention.

(58) O. N. L. asks the best point of the cylinder of the gas engine to explode the gas? A. Ignite the gas when the piston has completed about one-third of its stroke.

(59) H. J. H. asks: 1. What are the numbers of the three samples of wire inclosed, by the Brown and Sharpe wire gauge? A. The largest is between 23 and 24. Probably intended for 24. The others are respectively 30 and 36. 2. Are the four coils in the Dr. Bradley's improved tangent galvanometer (as described in "Haskins' Galvanometer") wound one on the other? If so, which one is wound first—the fine or the coarse? And how large is the bobbin or tube upon which they are wound? A. There are four coils. The finer wire is wound first. The bobbin is flat and about 1½ inches long. 3. And also how the needle for the same is made, how large the little magnets are, and how many? A. The needle proper is a disk of magnetized steel with aluminum pointer attached. The little magnets are no longer used. 4. How many coils, how wound, and how connected with each other in Queen's universal galvanometer? A. If built according to Bradley's pattern, there are four coils, whose resistances are respectively 150, 25, 3, and 0 ohms. One terminal of each coil is connected with the ground or return wire binding post. The opposite ends are each provided with a binding post. 5. What is the outside lever and inside arm in Bradley's galvanometer? A. It is an arrangement for lifting the needle and clamping it to the cover glass when not in use.

(60) S. McI. writes: I have a Corliss engine, 3 ft. stroke; how near to end of stroke should piston be before exhausting? A. The best point can only be determined by applying the indicator; the proper point depends largely upon size of ports, clearance, and speed of engine; in your case we should judge about 1¼ or 1½ inches. The larger the ports the nearer the point of exhaust can approach the end of the stroke.

(61) J. N. G. asks: 1. How can I hermetically seal the alcohol in a level glass, as it is done at the factories? I find that a sufficient heat from the blow pipe to anneal the glass tube will generate a gas and break before closing. A. Before introducing the alcohol, draw the ends of the tube into a very fine tube close to the bulbs, then fill the tube by expelling the air by heat and drawing in the alcohol by means of the vacuum. The small tube may be readily sealed without bursting the bulb. 2. How is the black, glossy finish put on tintypes used by photographers, and would the same finish do upon a gun barrel? A. It is japan baked on. It might be applied to a gun barrel. 3. In making an induction coil such as are used in microphones, etc., is it necessary to introduce an iron core? A. Yes.

(62) S. H. J. asks: Whether the zinc in a gravity battery is being acted upon when the circuit is open? A. Yes.

(63) A. M. J.—The wire is covered with gutta-percha.

(64) W. C. P. asks: 1. What are the dimensions of a Ruhmkorff coil such as is used in the laboratories for exploding gases, etc? A. The smallest coil that will give a spark will explode gases. 2. What is the rule for computing the length of the spark from any coil? A. The length of the spark depends upon so many conditions that it cannot be accurately calculated.

(65) J. R. asks: What is the simplest way to obtain the electric spark for igniting gas? What is best to ignite with? A. Use the spark of the extra current of an electro-magnet.

(66) J. W. G. asks: Is the name of the wheel barrow's inventor known? A. The wheel barrow is a very old invention. Its inventor could not have been far removed from Adam. We don't know his name.

(67) A. R. B. asks: 1. What term is used to describe the process of either grinding down the deep cuts between the teeth of cross cut timber saws, with emery wheel or file? A. Gumming is the technical name for the operation described. 2. How can I best get the painting and gilding of large letters on plate glass off without scratching the glass? A. Try a warm solution of caustic potash. 3. After using one of my finest paint brushes in shellac varnish, I find that the alcohol will not clean it well. What will do it? A. Ninety-five per cent of alcohol will do it.

(68) C. E. B. asks: 1. What is the length of the armature in the dynamo electric machine of Geo. M. Hopkins' design in SUPPLEMENT, No. 161? A. Four inches. 2. Do the magnets, A and B, require to be charged before being placed in position, if so, how can I charge them? A. The magnet needs no charging. The residual magnetism is sufficient to start the machine. 3. Can you give me a receipt for black ink, one that will be very black, and have the appearance of being varnished when dry? A. See ink receipts in SUPPLEMENT, No. 157. 4. Is the small boiler described in SUPPLEMENT, No. 182, on good principles, and a practical boiler for an engine 2 x 4 in.? A. Yes.

(69) C. M. L. says: Bisulphide of carbon vaporizes at 118, and expands a little rising 400 times, when we have added 94 degrees of heat and brought it up to the boiling point of water, which expands nearly 1,700 times; is it as good, all things considered, as water as a motive power? A. The bisulphide of carbon would be more economical, but all things considered not as good as water for a motive power.

(70) H. M. E. writes: 1. How can I finish induction and other coils in hard rubber? A. The small coils are usually inclosed in rubber tubing such as may be procured of rubber manufacturers in this city. The larger coils are wrapped with very thin sheets of hard rubber, the seam being located on the under side of the coil. 2. Does the incandescent light require a vacuum? If not, what size and length of platina wire should be used with five cells bichromate plunge battery plates 2½ x 6? A. A vacuum is necessary to prevent the carbon filament from burning. Platinum may be used in the open air, but it is very treacherous, being very liable to melt. Use two or three inches No. 34 wire. 3. Does this lamp (incandescent) require as much power as the arc light of equal brilliancy? A. For the same quantity of light the arc light is far more economical than the incandescent.

(71) J. H. M. asks: What kind of wax and chemicals is it that map engravers use in making cuts of maps? Or do they use chemicals, but take a plaster of Paris transfer after the map is drawn in the wax? A. When the maps are made on copper the following wax can be used: White wax, 2 oz.; black and Burgundy pitch, of each, ½ oz.; melt together; add by degrees powdered asphaltum, 2 oz., and boil till a drop taken out on a plate will break when cold, by being bent double two or three times between the fingers; it must then be poured into warm water and made into small balls for use. Nitric acid of 15° B. is the liquid used for eating the copper. Electrotypes are taken rather than plaster of Paris moulds.

(72) W. E. W. says: I have a 56 in. circular saw that has not been used in over a year (a smaller one used in place, one side of which is very rusty. What will take off the rust and make it bright? I cannot sell it as it is, but could if I can get off the rust? A. If kerosene will not remove the rust, try spirits turpentine and rottenstone. If the rust is deep, it must be ground out with emery. To preserve the concentric polish mount it on an arbor and rotate it, using emery and oil on a pine or other soft wood stick.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

Mrs. L. D. R.—The specimen is quartz (pure anhydrous silicic acid).—T. F. R.—The sample consists chiefly of pyrites (iron sulphide). It may carry gold. An assay costing $5.00 would be necessary to determine the value of the ore.

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March 18, 1884,

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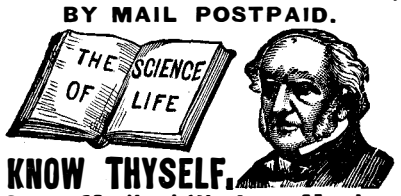

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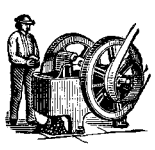

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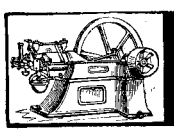

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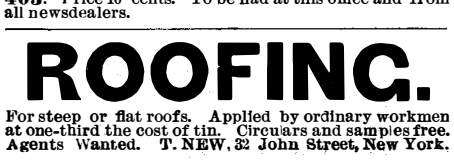

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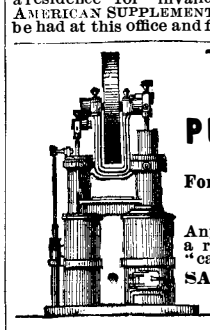

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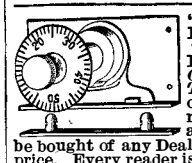

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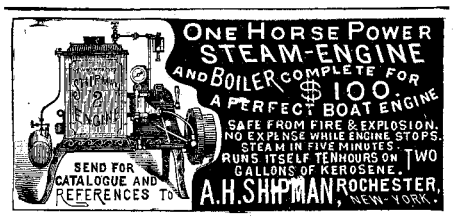
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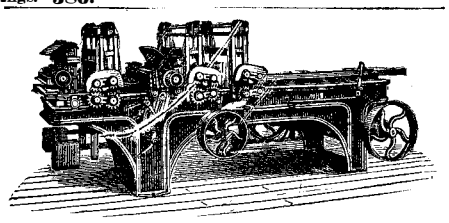

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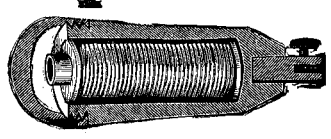

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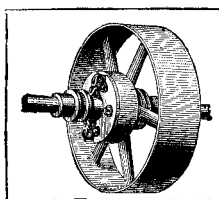

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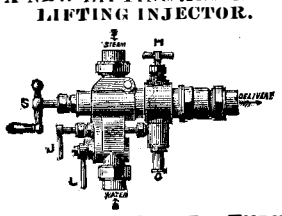

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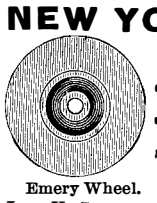

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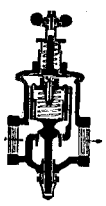

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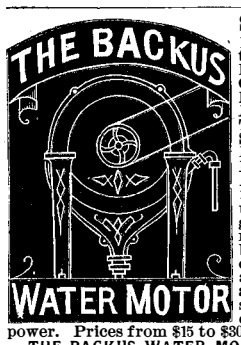

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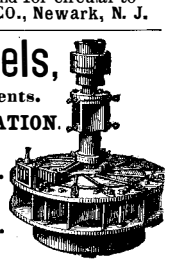

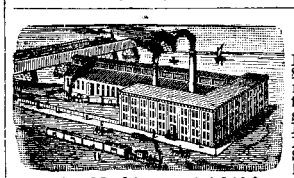

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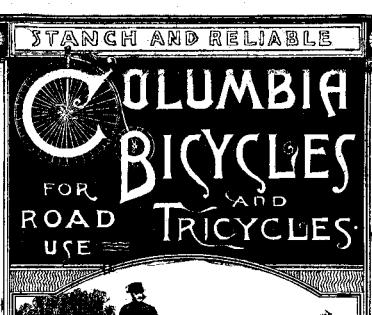

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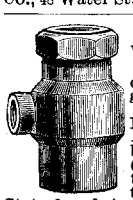

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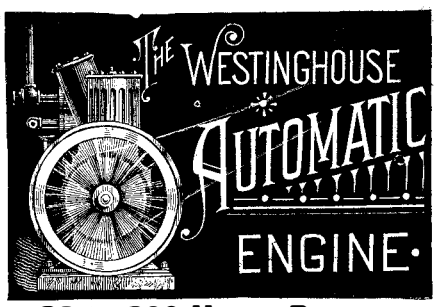

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